5 Detailed Results

This section contains detailed findings from:

- Questionnaires
- Site Surveys
- Coverage Maps
- County Meetings
- Project Research
- Design Strategy
- Preliminary Design

Also included are summary and conclusions for the project.

5.1 Stakeholder Needs & Issues – Consortium-Wide

The next two sections contain pie charts depicting the results from the following two questions in the County Stakeholder Questionnaire:

List, in priority order, up to five (5) communications improvements needed from initial dispatch to call completion.

List, in priority order, up to five (5) factors that will be critical to future radio system in your county, city, or area of jurisdiction.

The results from each county were tabulated, with items given scores as follows:

An item listed as #1 received five points.
An item listed as #2 received four points.
An item listed as #3 received three points.
An item listed as #2 received two points.
An item listed as #5 received one point.

This point system allowed for weight to be given to those items higher in priority.

5.1.1 Communication Improvement Priorities – Consortium Wide

List, in priority order, up to five (5) communications improvements needed from initial dispatch to call completion.

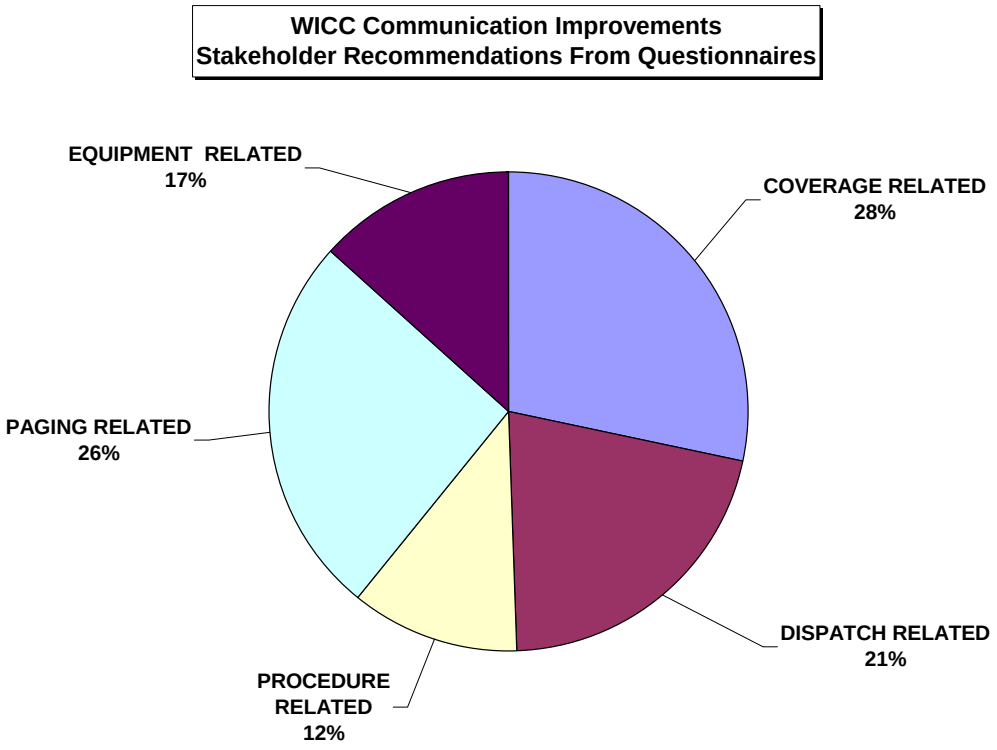

Figure 2 – Communications Improvements, WICC Total

Analysis

- Coverage is a factor for nearly everyone in the consortium. There are locations in each county where it is difficult to communicate with repeaters back to dispatch.
- Paging related improvements were not high on the list of concerns in meetings, but did show significant weight when the questionnaires were tabulated. This is an area that will need further investigation and potential solutions evaluated.
- Business practices and procedures, of which dispatch is a part, are high on the list of what needs to be addressed. These are areas that do not require extensive funding to improve.
- Equipment is still a big issue for many, even without taking P25 into consideration. Several agencies either have no radios at all, or are functioning with radios that are 20 years old or more.

5.1.2 Factors for Success – Consortium Wide

List, in priority order, up to five (5) factors that will be critical to future radio system in your county, city, or area of jurisdiction.

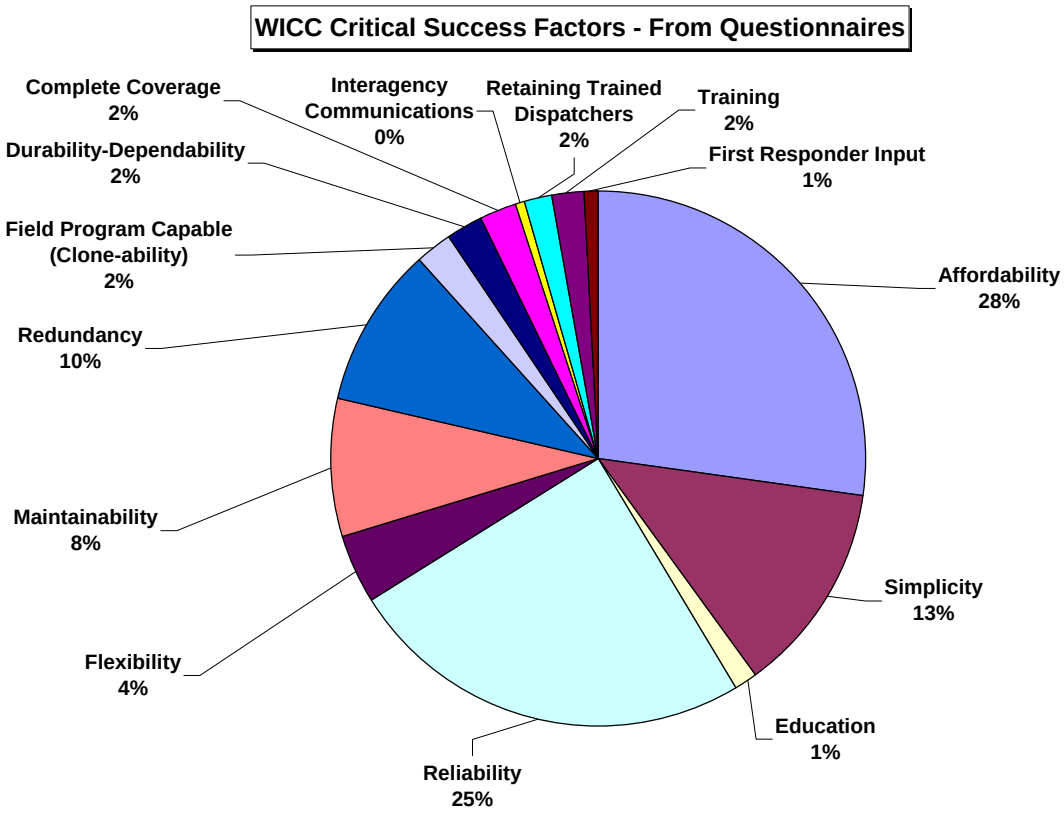

Figure 3 – Success Factors, WICC Total

Analysis

- Funding was one of the most discussed aspects in meetings as well as weighted in the questionnaires. Most, if not all of the counties in the WICC do not have a lot of money to spend on new equipment.
- The equipment needs to be reliable and easy to maintain. Again emergency response requires that radio communications be there when you need it and many times that is during extremes.
- Things need to be simple. Too much complexity and people will either not use it, or will forget how to use it. Many emergency responders are volunteers and do not have extensive training with radios. Also in emergency situations it is important that radio communication be as simple as possible. The more pressure on a person, the more they rely on reaction. Many times they do not have time to think through a scenario. Training on a new system will be a high priority before and during deployment.

5.1.3 Other Needs & Issues

This section contains those needs and issues, which are widespread throughout the consortium but not included in the sections above.

1. Dispatch is depended upon for support on all calls for service; however, agencies also use the same channel for tactical conversations, which overloads Dispatch with non-essential traffic. Because the Dispatch Center must monitor non-essential radio traffic, this leads to complaints that "Dispatch" is not answering the radio.

2. During the process of gathering information from the counties, it became obvious that a large number of those who were required to use radios (from dispatch through fire, EMS, and law enforcement) needed some training on how to use them more effectively. Sometimes this is simply a result of the fact that they do not use them very often, as in the case of a volunteer.

3. There is a lack of experienced dispatch personnel. This is due to low wages and high turnover in most counties.

4. There are several coverage issues in the WICC area due to severe terrain and distance between repeaters.

    a. In Mineral County, the biggest area of coverage concern is west of St. Regis to De Borgia on Interstate 90. This is a stretch of I-90 that produces more truck wrecks than normal due to the "S Curves".
    b. In Sanders County, another repeater is needed on the east end of the county. The areas not covered are used by fishermen, hunters, loggers, and hikers.
    c. In Ravalli County, the South Valley needs attention to determine what will be acceptable based on their geographic situation.
    d. In Lake County, the areas that are not covered by mobile radios are areas that really need the coverage. These areas tend to be small, but if the incident falls with these areas, it is difficult to order more resources, cancel dispatched resources, or give the responding units an adequate size up of the incident.

5. Procedures need to be refined to address frequency use.

6. The addition of data added to the functions of any future system. It is not used now because it is not possible, but will become nearly mandatory to get information from a variety of sources and send it through the communications system to the responders in the field. Examples are current specifications on air bag locations on the specific car a team is about to dismantle, owner information for the property they are attempting to access, Internet access, and access to fire station databases via radio where there is no cell phone coverage.

7. Communication systems must be changed to Narrowband by 2013, a mere 8 years from now.

5.1.4 Concerns

Some of the concerns documented in meetings include the following points.

- Channel congestion is a problem in Mineral and Sanders counties.
- Systems must be rugged and reliable and able to operate effectively in failure mode and that any new design incorporates failover capabilities.
- Costs for a new system were always discussed to include new equipment as well as recurring maintenance.
- There were concerns and questions raised regarding the process that will be used to allocate funds to the counties of the consortium.
- County agencies do not want to loose things like control over dispatch, the ability to control their communications infrastructure.
- Nearly all meetings had discussions where users were concerned with a system that would become too complex and difficult to use.
- The volunteers in the fire community want to carry small pagers instead of the larger handheld radios.

5.2 Stakeholders, Needs & Issues By County

This section of the document contains the results from the information-gathering process within each county.

Important Note: In many of the meetings held in individual counties, there were issues brought up which are not consortium issues, or issues that can or should be addressed at the consortium level. These concerns have all been documented in the meeting minutes from those meetings (which all appear in Appendix G to this document), but they may not be repeated or documented in this section. The concentration in this document was on items relevant to and addressable by the consortium.

5.2.1 Mineral County

County Representative: George Gupton
Number Of County Stakeholder Questionnaires Returned: 7
Number Of County Agencies Represented By Questionnaires: 7

5.2.1.1 Mineral County Concerns or Issues

1. Communications Improvements

The following pie chart depicts the communications improvements desired by the responding stakeholders in this county:

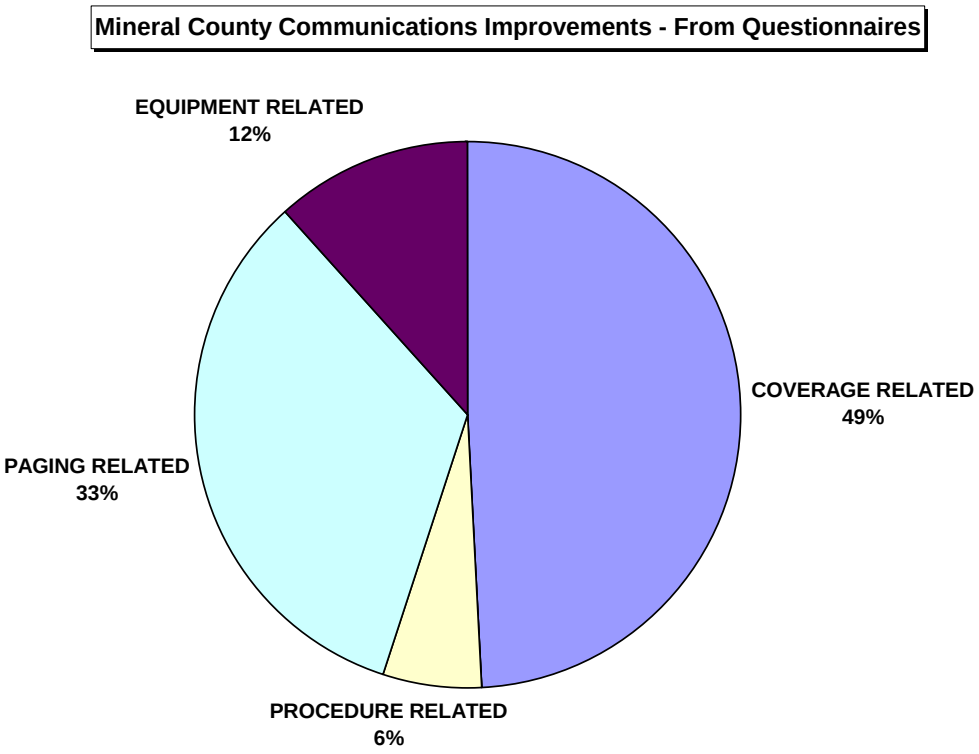

Figure 4 – Communications Improvements, Mineral County

How to read this chart:
Stakeholders were asked to list, in priority order, the top five communications improvements they would like to see. Those items ranked higher were given a higher point value than those ranked lower. A percentage was then calculated. If the chart contains less than five "wedges," this means the stakeholders did not list the full five possible items.

2. Success Factors

The following chart depicts the success factors considered critical by the responding stakeholders in this county in order for the WICC radio project to be successful.

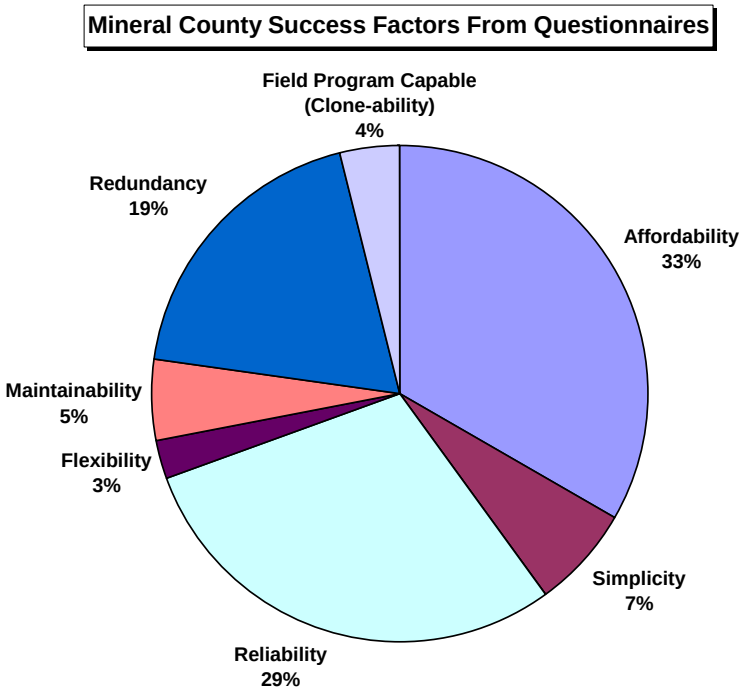

Figure 5 – Critical Success Factors, Mineral County

How to read this chart:

Stakeholders were asked to list, in priority order, the top five factors they felt were most necessary for the WICC radio project to be successful. Those items ranked higher were given a higher point value than those ranked lower, in order to give higher-ranked items more weight. A percentage for each item was then calculated. If the chart contains less than five items ("wedges"), this indicates the stakeholders did not list the full five possible items.

Some of the same items often appear in both the communications improvements chart and the critical success factors chart. This indicates that these items are very important to the stakeholders.

5.2.1.2 Mineral County Agency Interactions

Mineral County

Key:
E - Emergency Basis Only
A - Administrative & Emergency Basis

	Ambulance	Mineral DES	Superior FD	EMS	Mineral Co.Sheriff	Sanders Co.Sheriff	Ravalli Co.Sheriff	Lake Co.Sheriff	Montana Highway Patrol	US Marshals Office	QRU	USFS	MDOT	FBI	DEA	FWP	Mineral Search & Rescue	St. Regis VFD	State Highway Department	State DES	Missoula Co. Sheriff	Shoshone Co. Sheriff	ID Sheriff	US DOT	Salish and Kootenai Tribes	West End VFG
Ambulance																										
Mineral DES																										
Superior FD	E																									
EMS																										
Mineral Co.Sheriff	E	A	A	A																						
Sanders Co.Sheriff		E			A																					
Ravalli Co.Sheriff					A																					
Lake Co.Sheriff					A																					
Montana Highway Patrol	E		E		A																					
US Marshals Office					A																					
QRU																										
USFS					A																					
MDOT		E			A																					
FBI		E			E																					
DEA					E																					
FWP					A																					
Mineral Search & Rescue	A	E	A	E	A					E	A		E		A											
St. Regis VFD					E				E							E										
State Highway Department	E		E														E									
State DES		E																								
Missoula Co. Sheriff		E																								
Shoshone Co. Sheriff		E																								
ID Sheriff		E																								
US DOT		E																								
Salish and Kootenai Tribes		E																								
West End VFG	E	E	E	E	E											E	E	E								

Figure 6 – Agency Interactions, Mineral County

5.2.2 Sanders County

County Representative: Mark Denke
Number Of County Stakeholder Questionnaires Returned: 4
Number Of County Agencies Represented By Questionnaires: 4

5.2.2.1 Sanders County Concerns or Issues

1. Communications Improvements

The following pie chart depicts the communications improvements desired by the responding stakeholders in this county:

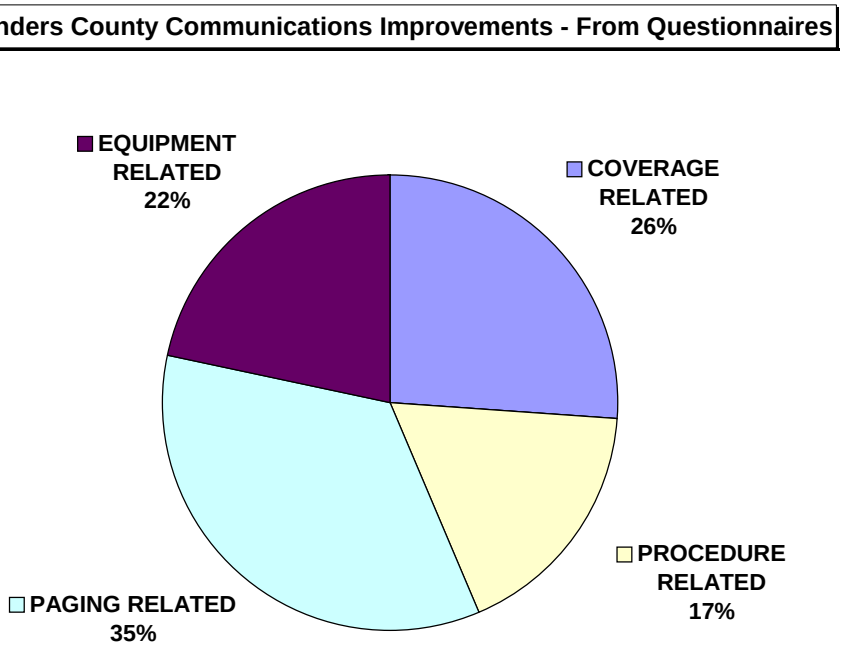

Figure 7 – Communications Improvements, Sanders County

How to read this chart:
Stakeholders were asked to list, in priority order, the top five communications improvements they would like to see. Those items ranked higher were given a higher point value than those ranked lower. A percentage was then calculated. If the chart contains less than five "wedges," this means the stakeholders did not list the full five possible items.

2. Success Factors

The following chart depicts the success factors considered critical by the responding stakeholders in this county in order for the WICC radio project to be successful.

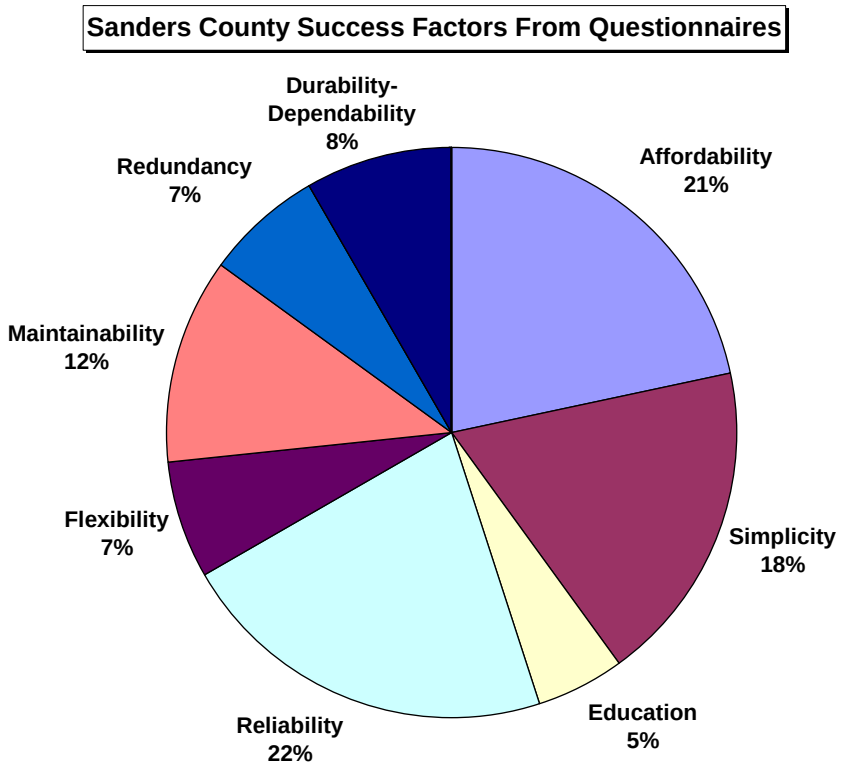

Figure 8 – Critical Success Factors, Sanders County

How to read this chart:
Stakeholders were asked to list, in priority order, the top five factors they felt were most necessary for the WICC radio project to be successful. Those items ranked higher were given a higher point value than those ranked lower, in order to give higher-ranked items more weight. A percentage for each item was then calculated. If the chart contains less than five items ("wedges"), this indicates the stakeholders did not list the full five possible items.

Some of the same items often appear in both the communications improvements chart and the critical success factors chart. This indicates that these items are very important to the stakeholders.

5.2.2.2 Sanders County Interactions

Sanders County

Key:
E - Emergency Basis Only
A - Administrative & Emergency Basis

	Thompson Falls Public Works	Probation and Parole Officer	Montana DOT	County Road Department	Mineral Co.Sheriff	Sanders Co.Sheriff	Lincoln Co. Sheriff	Lake Co.Sheriff	Missoula Co. Sheriff	US Marshals Office	Montana Highway Patrol	All County Deputies	USFS	FBI	Flathead Tribal Agencies	FWP	Sanders Search & Rescue	Dixon Fire	Hot Springs Fire	Hot Springs Police	Hot Springs Ambulance	Plains Fire (Rural & City)	Plains Ambulance	Plains Police	Thompson Falls Fire (Rural & City)	Thompson Falls Police	Thompson Falls Ambulance	Trout Creek Fire	Noxon Fire	Noxon Ambulance	Heron Fire	Mission Ambulance	Bull River Ambulance	Clark Fork Ambulance	Life Flight	Alert	Med Star	Department of State Lands	Dispatch	OEM
Thompson Falls Public Works																																							
Probation and Parole Officer																																							
Montana DOT																																							
County Road Department																																							
Mineral Co.Sheriff																																							
Sanders Co.Sheriff		A			E																																		
Lincoln Co. Sheriff						E																																	
Lake Co.Sheriff						E																																	
Missoula Co. Sheriff						E																																	
US Marshals Office						E																																	
Montana Highway Patrol						E																																	
All County Deputies						A																																	
USFS						E																																	
FBI						E																																	
Flathead Tribal Agencies						E																																	
FWP						E																																	
Sanders Search & Rescue						E																																	
Dixon Fire						A																																	
Hot Springs Fire						A								E																									
Hot Springs Police						A																																	
Hot Springs Ambulance						A																																	
Plains Fire (Rural & City)						A																																	
Plains Ambulance						A																																	
Plains Police						A																																	
Thompson Falls Fire (Rural & City)	A		E	E		A						E						E			E																		
Thompson Falls Police						A							E												A															
Thompson Falls Ambulance						A																				E													
Trout Creek Fire						A																			E														
Noxon Fire						A																			E														
Noxon Ambulance						A																																	
Heron Fire						A																			E														
Mission Ambulance						A																																	
Bull River Ambulance						A																																	
Clark Fork Ambulance						A																																	
Life Flight						E																																	
Alert						E																																	
Med Star						E																																	
Department of State Lands																									E														
Dispatch																		A																					
OEM																		E																					

Figure 9 – Agency Interactions, Sanders County

5.2.3 Ravalli County

County Representative:	Ron Nicholas
Number Of County Stakeholder Questionnaires Returned:	3
Number Of County Agencies Represented By Questionnaires:	3

5.2.3.1 Ravalli County Concerns or Issues

1. Communications Improvements

The following pie chart depicts the communications improvements desired by the responding stakeholders in this county:

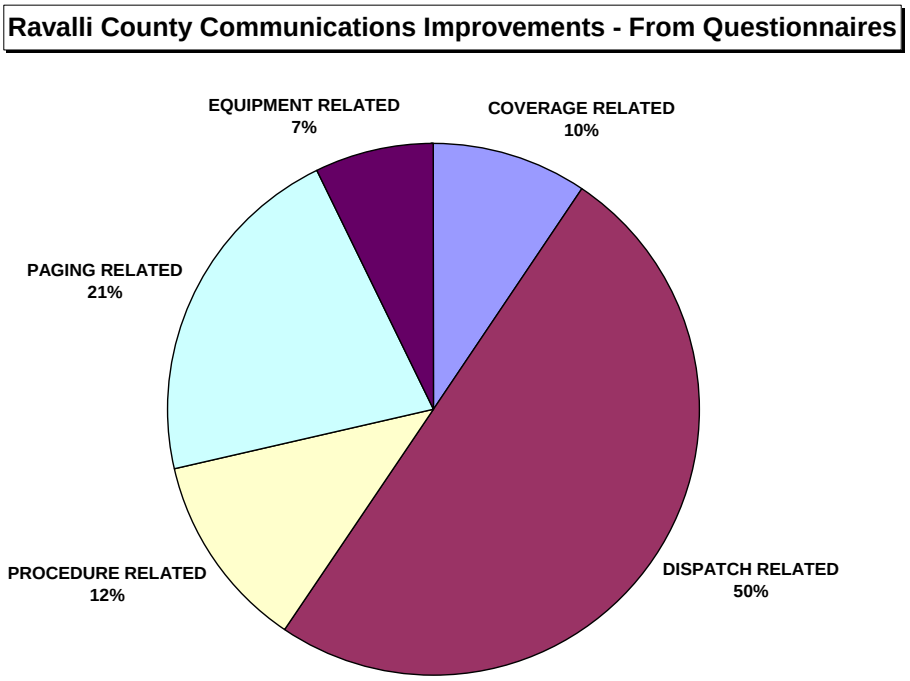

Figure 10 – Communications Improvements, Ravalli County

How to read this chart:
Stakeholders were asked to list, in priority order, the top five communications improvements they would like to see. Those items ranked higher were given a higher point value than those ranked lower. A percentage was then calculated. If the chart contains less than five "wedges," this means the stakeholders did not list the full five possible items.

2. Success Factors

The following chart depicts the success factors considered critical by the responding stakeholders in this county in order for the WICC radio project to be successful.

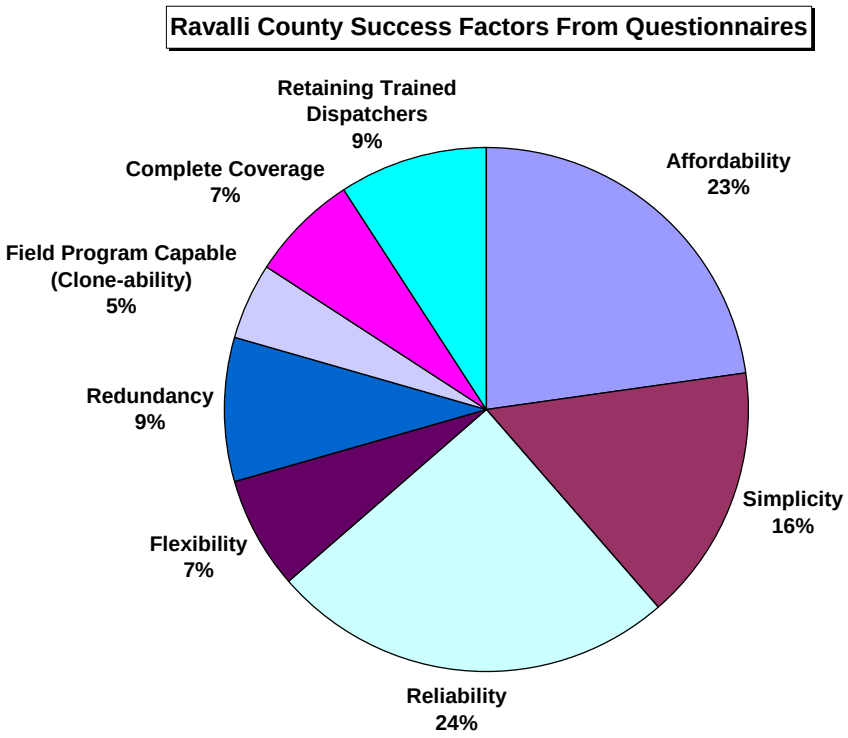

Figure 11 – Critical Success Factors, Ravalli County

How to read this chart:

Stakeholders were asked to list, in priority order, the top five factors they felt were most necessary for the WICC radio project to be successful. Those items ranked higher were given a higher point value than those ranked lower, in order to give higher-ranked items more weight. A percentage for each item was then calculated. If the chart contains less than five items ("wedges"), this indicates the stakeholders did not list the full five possible items.

Some of the same items often appear in both the communications improvements chart and the critical success factors chart. This indicates that these items are very important to the stakeholders.

5.2.3.2 Ravalli County Interactions

Ravalli County

Key:
E - Emergency Basis Only
A - Administrative & Emergency Basis

	Dispatch	West Fork Fire	West Fork Ranger	USFS	Darby Fire	Sula Fire	Ambulance	Life Flight	Ravalli Search & Rescue	Painted Rocks Fire Rescue	Law Enforcement	EMS	Haz Mat Team	Power Company	Ravalli County Fire		
Dispatch																	
West Fork Fire																	
West Fork Ranger																	
USFS																	
Darby Fire																	
Sula Fire																	
Ambulance																	
Life Flight																	
Ravalli Search & Rescue																	
Painted Rocks Fire Rescue	E	E	E	E	E	E	E	E	E								
Law Enforcement																	
EMS																	
Haz Mat Team																	
Power Company																	
Ravalli County Fire	A	A			A	A				A	A	A	A	A			

Figure 12 – Agency Interactions, Ravalli County

5.2.4 Lake County

Agency Representative:	Steve Stanley
Number Of Agency Stakeholder Questionnaires Returned:	4
Number Of Agency Agencies Represented By Questionnaires:	5

5.2.4.1 Lake County Concerns or Issues

1. Communications Improvements

The following pie chart depicts the communications improvements desired by the responding stakeholders in this county:

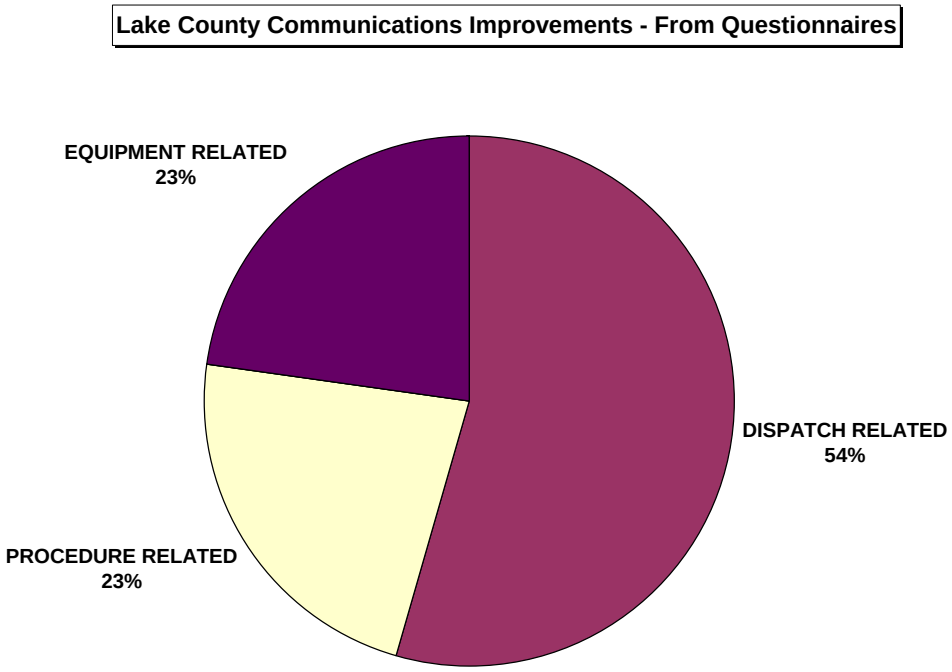

Figure 13 – Communications Improvements, Lake County

How to read this chart:
Stakeholders were asked to list, in priority order, the top five communications improvements they would like to see. Those items ranked higher were given a higher point value than those ranked lower. A percentage was then calculated. If the chart contains less than five "wedges," this means the stakeholders did not list the full five possible items.

2. Success Factors

The following chart depicts the success factors considered critical by the responding stakeholders in this county in order for the WICC radio project to be successful.

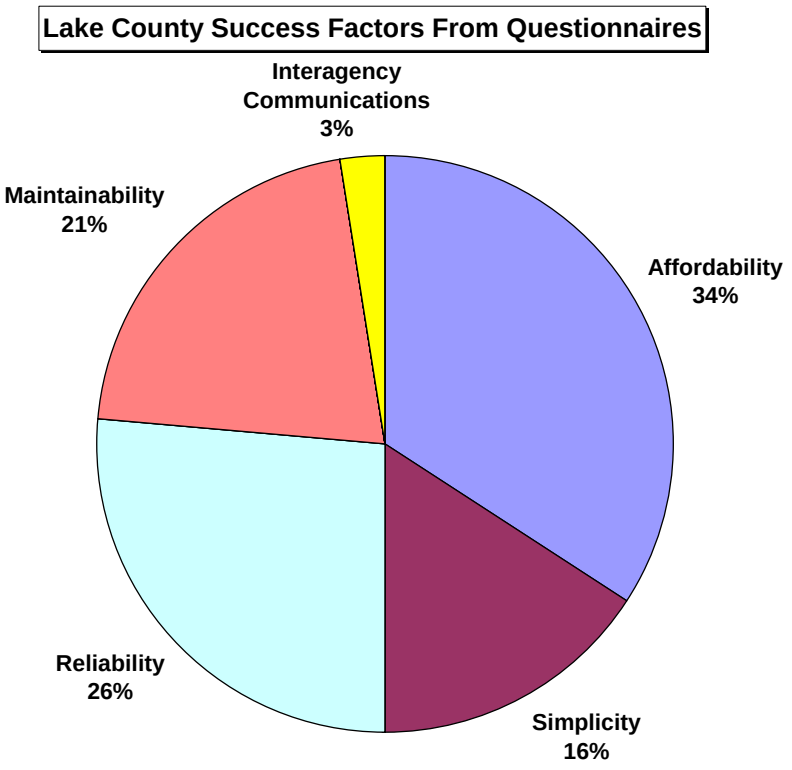

Figure 14 – Critical Success Factors, Lake County

How to read this chart:

Stakeholders were asked to list, in priority order, the top five factors they felt were most necessary for the WICC radio project to be successful. Those items ranked higher were given a higher point value than those ranked lower, in order to give higher-ranked items more weight. A percentage for each item was then calculated. If the chart contains less than five items ("wedges"), this indicates the stakeholders did not list the full five possible items.

Some of the same items often appear in both the communications improvements chart and the critical success factors chart. This indicates that these items are very important to the stakeholders.

5.2.4.2 Lake County Interactions

Lake County

Key:
E - Emergency Basis Only
A - Administrative & Emergency Basis

	Adjacent Fire Districts & Departments	Tribal Fire and Emergency Mgmt	County Emergency Mgmt	Ambulance Services	Life Flight	Alert	Local Law Enforcement	County Law Enforcement	State law Enforcement	Lake County	Flathead County	Chief Cliff	Rollins	Somers Fire	Polson Fire (City & Rural)	Lakeside QRU	Confederated Salish & Kootenai Tribes	Border Patrol	Highway Department		
Adjacent Fire Districts & Departments																					
Tribal Fire and Emergency Mgmt																					
County Emergency Mgmt																					
Ambulance Services																					
Life Flight																					
Alert																					
Local Law Enforcement	A	A	A	A	A	A															
County Law Enforcement							A														
State law Enforcement							A														
Lake County																					
Flathead County																					
Chief Cliff																					
Rollins																					
Somers Fire							A														
Polson Fire (City & Rural)	A	A	A	A	A	A	A	A	A												
Lakeside QRU						E	A			E	E	E	E	E							
Confederated Salish & Kootenai Tribes							A														
Border Patrol							A														
Highway Department							A														

Figure 15 – Agency Interactions, Lake County

5.3 Existing Physical Infrastructure

The following site map displays all sites, coverage shown in maroon and dead spots shown in blue.

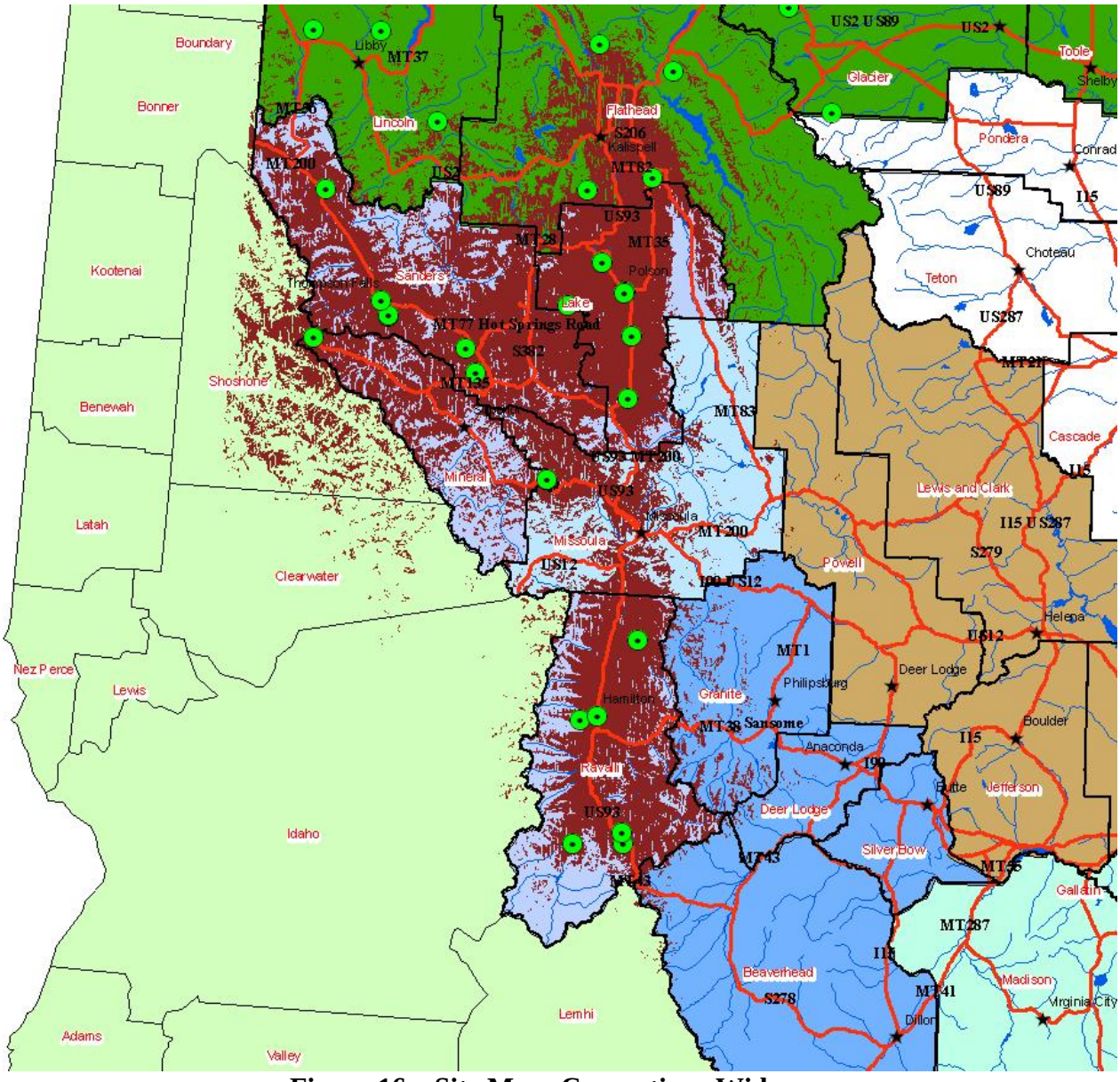

Figure 16 – Site Map: Consortium-Wide

5.4 Site Surveys

The coverage maps for sites selected to be trunked sites show coverage in maroon. The maps for the sites which have been chosen to remain conventional show coverage in grey.

5.4.1 Lookout Pass

Site Pictures

Site Description:

This site is located on Lookout Mountain. It needs some housekeeping help and grounding.

Area:

This site is located on Lookout Mountain.

Owner:

USFS

Elevation:

1841M

Latitude:

47 27 15.18

Longitude:

115 40 19.67

Tower:

Free standing, 35 ft., good condition

Building Type:

Brick/Block

Building Size:

Large

List of Users at this site:

- Mineral County Sheriff
- MDT
- MHP
- Ham
- DOJ

Radios at this site:

- Motorola Quantar Repeater
- MT Hwy Patrol
- Montana DOT
- Ham Radio (not in use)

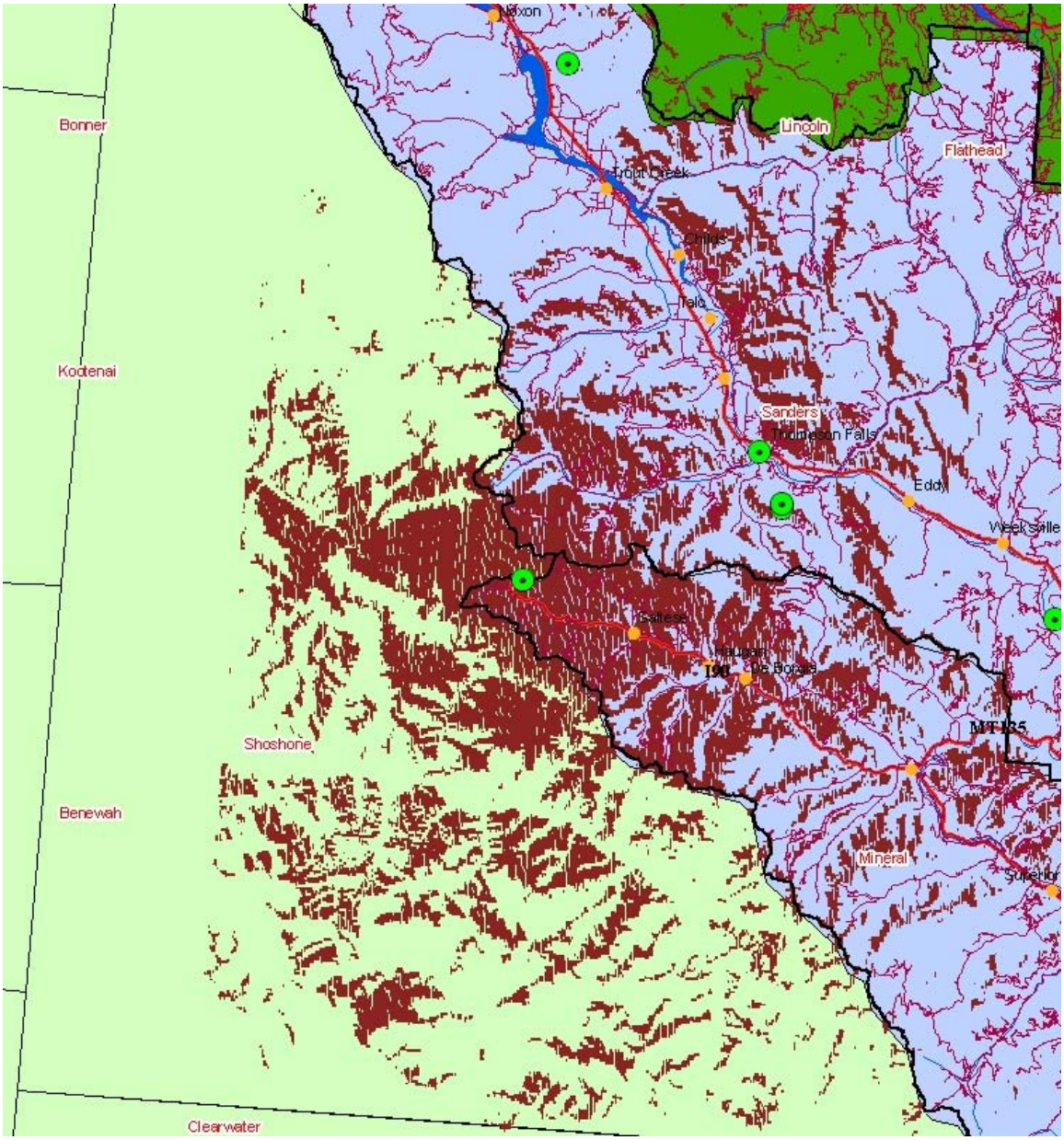

Figure 17 – Coverage Map: Lookout Pass

5.4.2 Ellis Mountain

Site Pictures

Site Description:

This site is located at the CAA Beacon Site near Ellis Mountain.

Area:

The site is on Ellis Mountain.

Owner:

unknown

Elevation:

5738 ft.

Latitude:

47 01 49.95

Longitude:

114 28 13.28

Tower:

Free standing, 56 ft., good condition

Building Type:

Wood Frame

Building Size:

10'x12'

List of Users at this site:

- Mineral County Sheriff
- Omnicon

Radios at this site:

- Motorola Quantar Repeater
- Omnicon

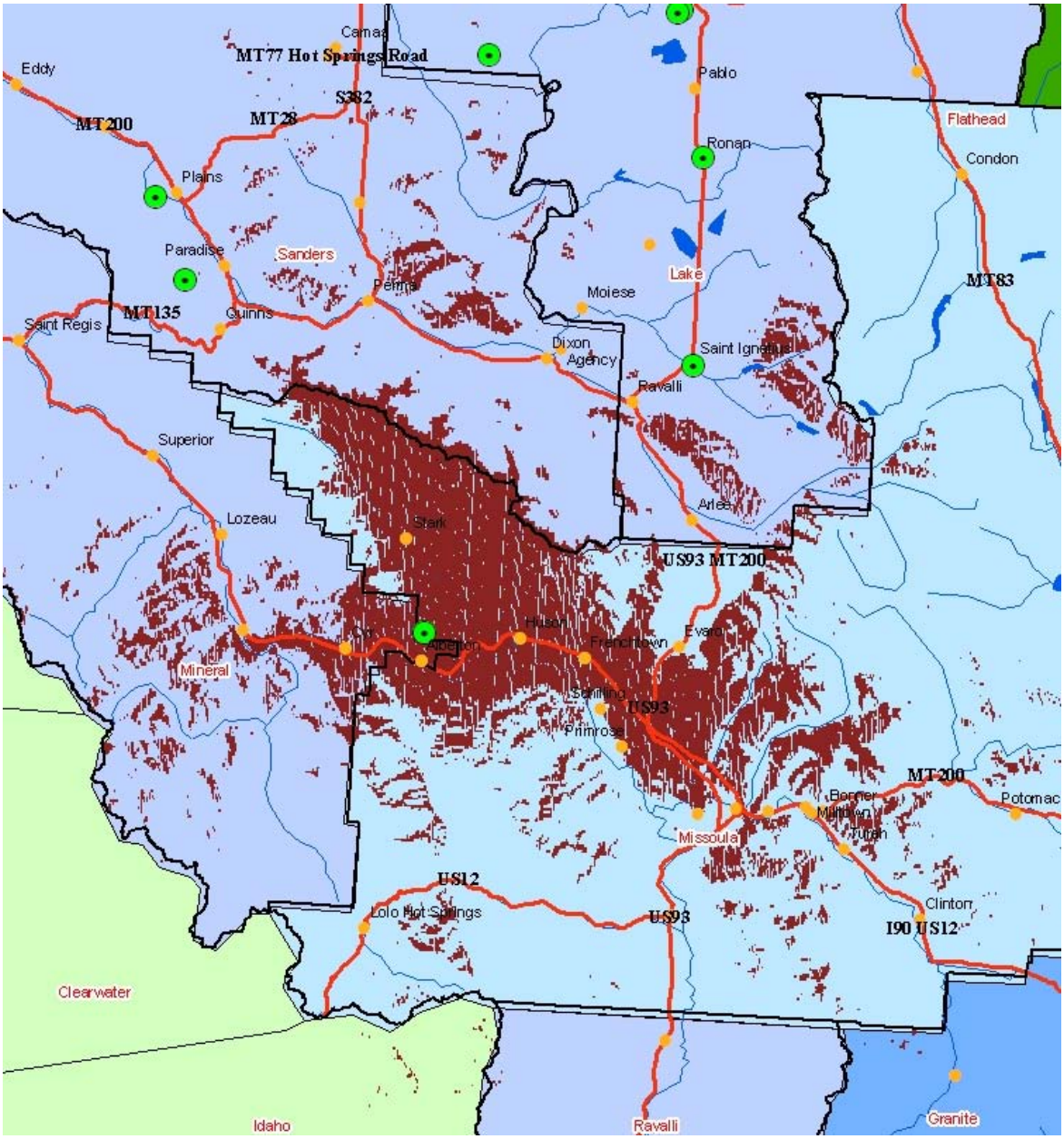

Figure 18 – Coverage Map: Ellis Mountain

5.4.3 Thompson Peak

Site Pictures

Site Description:

The site is located on Thompson Peak. The site has fiber buried to it with several unused pairs.

Area:

This site is near Superior, Montana.

Owner:

USFS

Elevation:

4632 ft.

Latitude:

47 19.085

Longitude:

114 54.468

Tower:

Free standing, 57 ft., good condition

Building Type:

Concrete block with 2nd floor Lookout

Building Size:

16'x22'

List of Users at this site:

- Mineral County Sheriff
- USFS
- Omnicon
- Cell One
- Verizon
- Felstet
- Mineral County Road Department
- Montana DOT
- MHP (2nd floor)
- FBI (2nd floor)
- F.S. Radio (2nd floor)

Radios at this site:

- Telewave Dual Isolators (5)
- Telewave VHF Multicoupler SN 1081 Model TWR5-150 S-P
- Redistribution Mdl DST-10 New MAR
- Quantar (5)
- Dataradio Sinclair Mdl Q3220E SN CT79211-1-1
- Dataradio S-3 Mdl Paragon DR-4800 SN 12681
- Dataradio Paragon PD Base #2 SN 12681

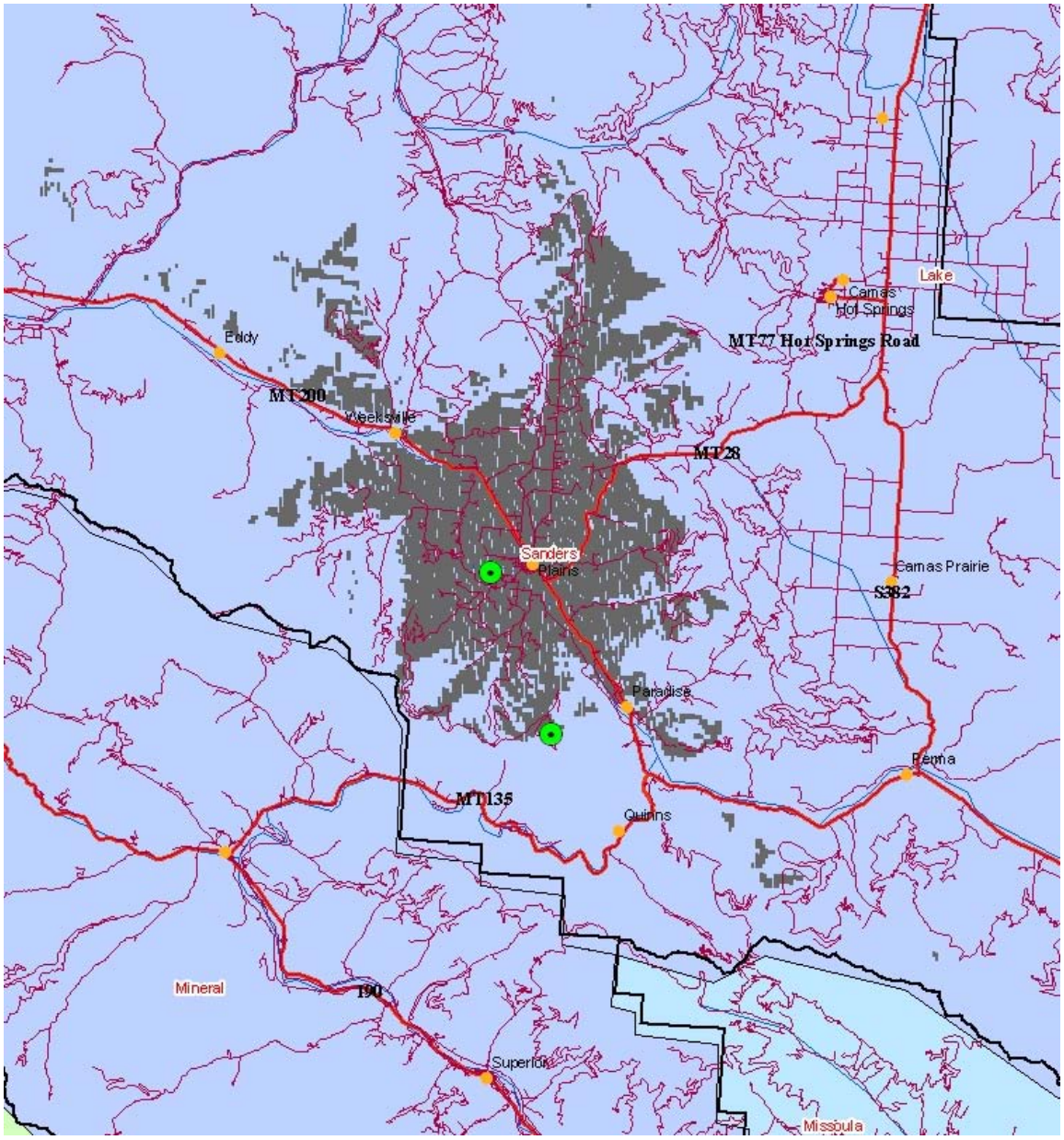

Figure 19 – Coverage Map: Thompson Peak

5.4.4 Clarks Peak

Site Pictures

Online picture not available, refer to Appendix D.

Site Description:

This site is under construction with Verizon Wireless building an addition onto the county building.

Area:

This site is 4 miles southeast of Thompson Falls, Montana.

Owner:

Sanders County – USFS Lease

Elevation:

5045 ft.

Latitude:

47 32.539

Longitude:

115 18.744

Tower:

Free standing, 100 ft., good condition

Building Type:

Block, with a new concrete block/metal roof addition

Building Size:

12'x16' with a new 12'x28' addition by Verizon Wireless

List of Users at this site:

- Sanders County
- Thompson Falls Rural Fire
- Montana Highway Patrol
- Verizon Wireless

Radios at this site:

- Motorola Repeater Model C73KkSB3106B SN# 482CKQ0022
- Motorola Quantar Base Model T5365A with X437 9.6 KBPS Modem
- Motorola Quantar Repeater Model T5365A
- Motorola Quantar Base Model T5365S with X437 9.6 KBPS Modem
- Motorola Quantar Base Model T5365A with X437 9.6 KBPS Modem
- Moseley NXE1 Microwave
- Moseley NXE1 Microwave (2nd) unit
- Motorola GM300 Radius Mobile Base
- GE Master II Repeater (moving into building October 2005)
- Analog and Digital wireless phone equipment (Verizon Wireless)
- Harris Microwave (Verizon Wireless)

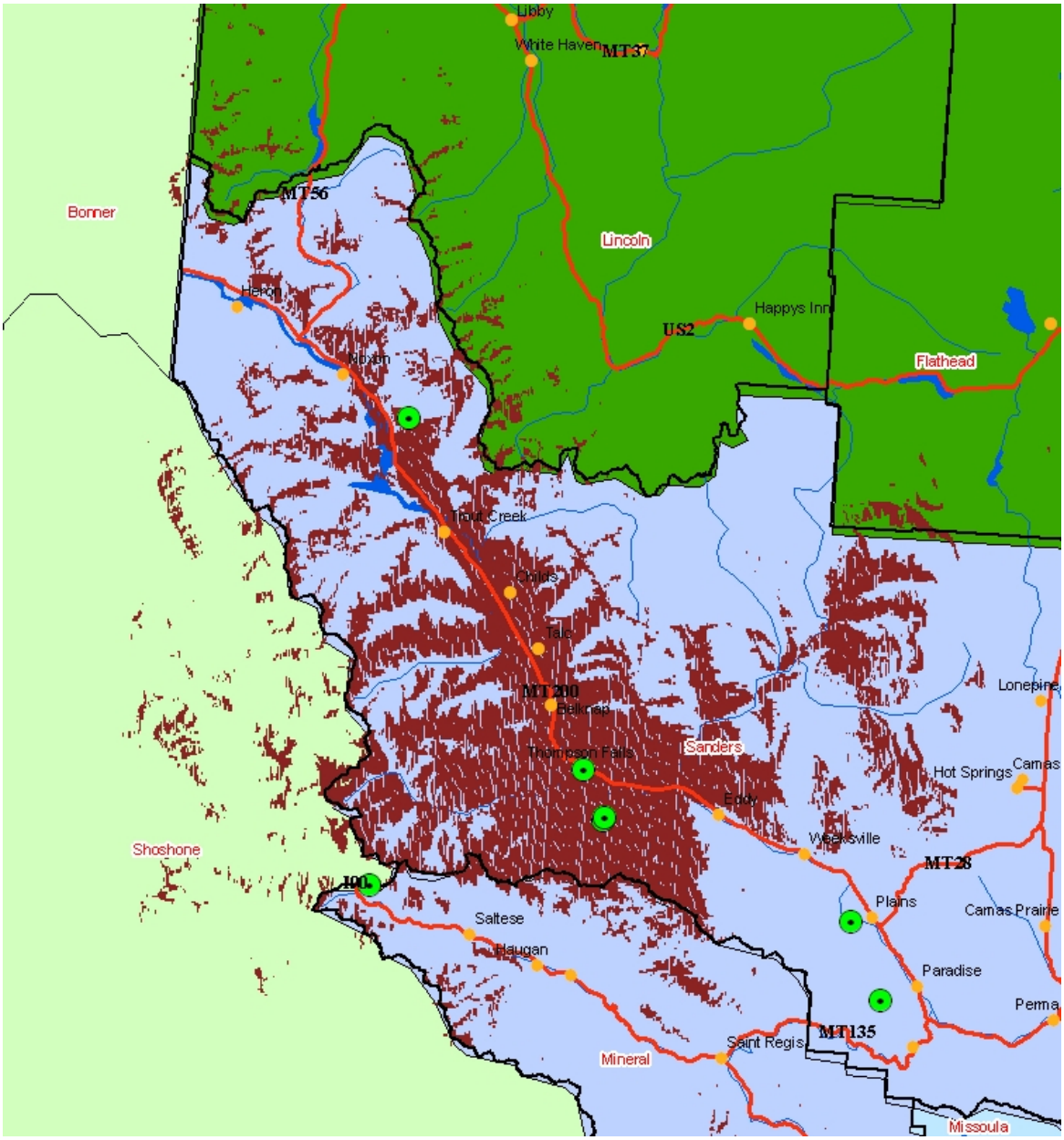

Figure 20 – Coverage Map: Clarks Peak

5.4.5 Clarks Peak/Hickman Sites

Site Pictures

Online picture not available, refer to Appendix D.

Site Description:

This site is located close to the Clarks Peak site.

Area:

This site is 4 miles southeast of Thompson Falls, Montana.

Owner:

Hickman Sites – USFS Lease

Elevation:

5045 ft.

Latitude:

47 32 742

Longitude:

115 18 746

Tower:

Guyed tower, 110 ft., fair condition

Building Type:

Concrete slab

Building Size:

10'x20'

List of Users at this site:

- Yellowstone Pipeline/Conoco-Phillips
- Federal Bureau of Investigation
- Montana Department of Transportation
- Hickman Sites
- Stine Electronics

Radios at this site:

- GE Master II Link Radio
- GE Master II Repeater
- GE DC Model SC76YAU66B
- Motorola MSF-5000 repeater
- GE Master II Model DC76YAU66B
- Tait Repeater
- Digital Paging Units

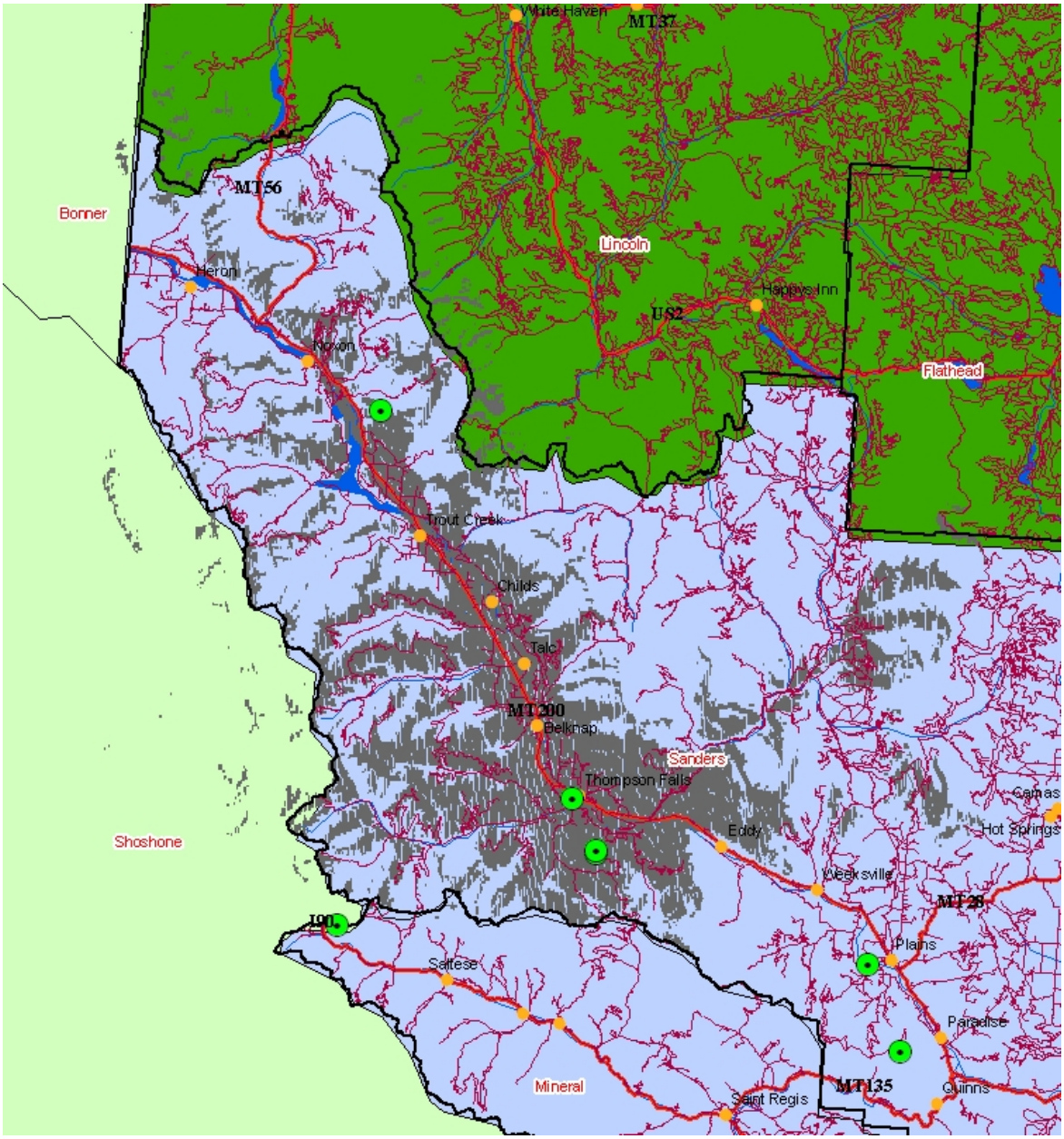

Figure 21 – Coverage Map: Clarks Peak/Hickman Sites

5.4.6 Pats Knob

Site Pictures

Online picture not available, refer to Appendix D.

Site Description:

The building on this site is in fair condition, but has only 10% available space. This site has several users.

Area:

This site is 6 miles SE of Plains, Montana

Owner:

Lolo National Forest

Elevation:

6837 ft.

Latitude:

47 22.333

Longitude:

114 51.528

Tower:

Free standing, 48 ft., fair condition

Building Type:

2 story concrete block with second story wood structure

Building Size:

16'x16'

List of Users at this site:

- Montana Department of Transportation
- Montana Highway Patrol
- Sanders County Sheriff's Office
- Northwestern Inc
- Montana Logging Association
- Keith Rodgers - HAMM radio
- Plains Paradise Television District
- Montana Department of Natural Resources and Conservation

Radios at this site:

- Motorola Quantar Model T5365A
- Motorola MOT9000 Link Radio
- GE Master II SN 5325564
- GE Master II Repeater
- Uniden Link Radio CutBank
- Uniden Link Radio Bigfork
- GE Master II Repeater
- Motorola MSR 2000 Link Radio
- Tait Repeater Station
- Motorola MSR 2000
- Motorola Model C73RCB-1105ET-SP407 Repeater

- Larcan XLS100MU SN 6916-9508-001
- Larcan BZ5MX100UX SN 9747-5
- L-TTC Channel Processor P379A SN P4703
- Larcan Model 40D2206GA MX100U SN 25003-48 (NOT IN USE)
- L-TTC Model P379A SN P4017 Channel Processor (NOT IN USE)

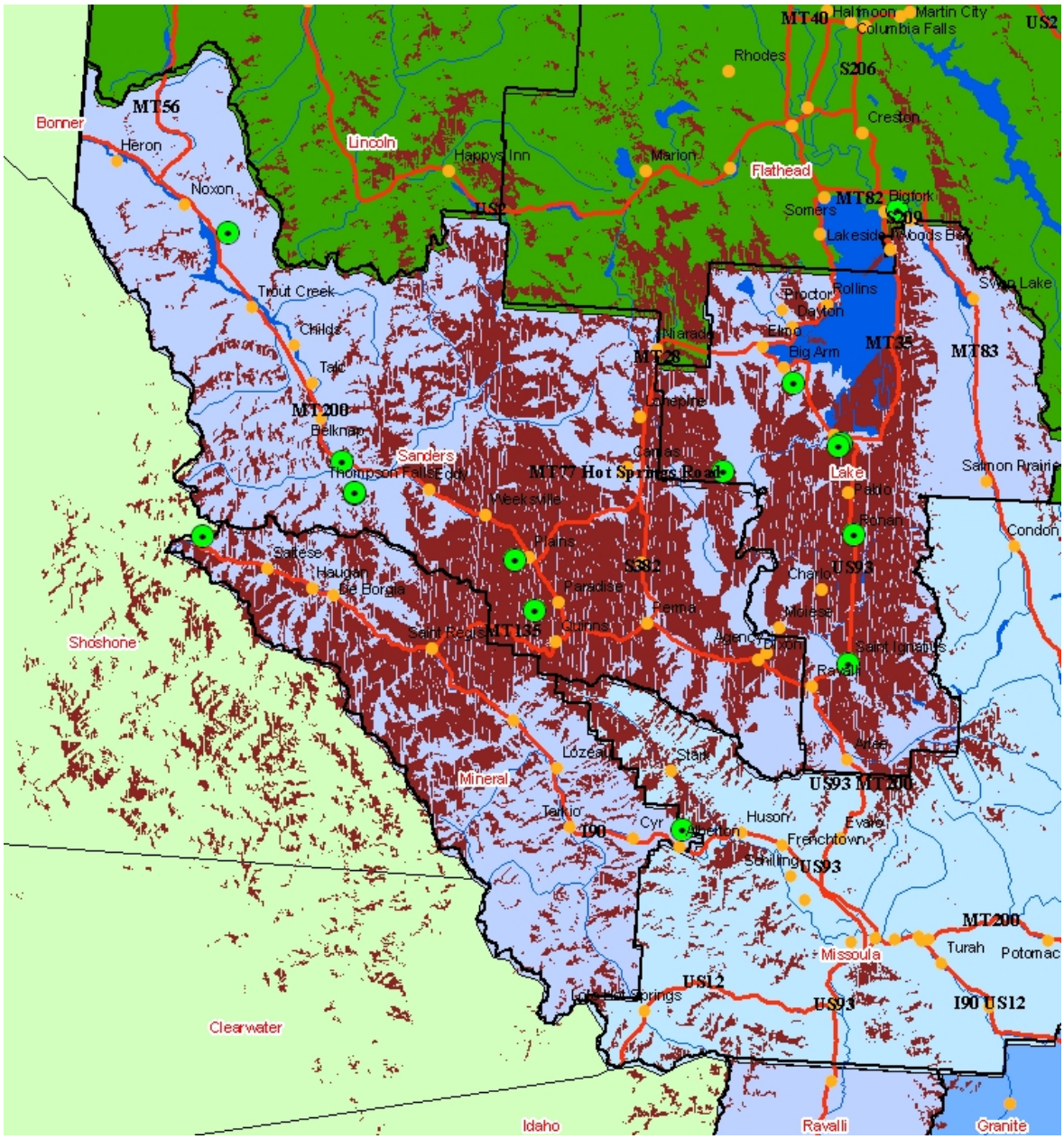

Figure 22 – Coverage Map: Pats Knob

5.4.7 Green Mountain

Site Pictures

Online picture not available, refer to Appendix D.

Site Description:

This site would need many improvements for any large-scale operation. The utility pole is not capable of a heavy load of antennas.

Area:

This site is 5 ¼ miles SE of Noxon, Montana

Owner:

J&R Electronics

Elevation:

4895 ft.

Latitude:

47 57.288

Longitude:

115 40.061

Tower:

Wood utility pole, 75 ft.

Building Type:

Converted trailer

Building Size:

8'x20'

List of Users at this site:

- Sanders County Sheriff's Office
- Northern Lights
- Federal Bureau of Investigation
- Cabinet Ranger District-Kootenai National Forest
- Russ Schenck
- J&R Electronics

Radios at this site:

- GE Master II SN# 9466048SPL
- Motorola Quantar Model C73RX13-3106BT-SP50 SN 525CMN0068
- Motorola Micor SN# 525CPC0095 Model# C73PXB-3196B-C569ADSP
- Motorola Model C71B78-3105 AT SN# MA732M
- EF Johnson
- (2) Daniels

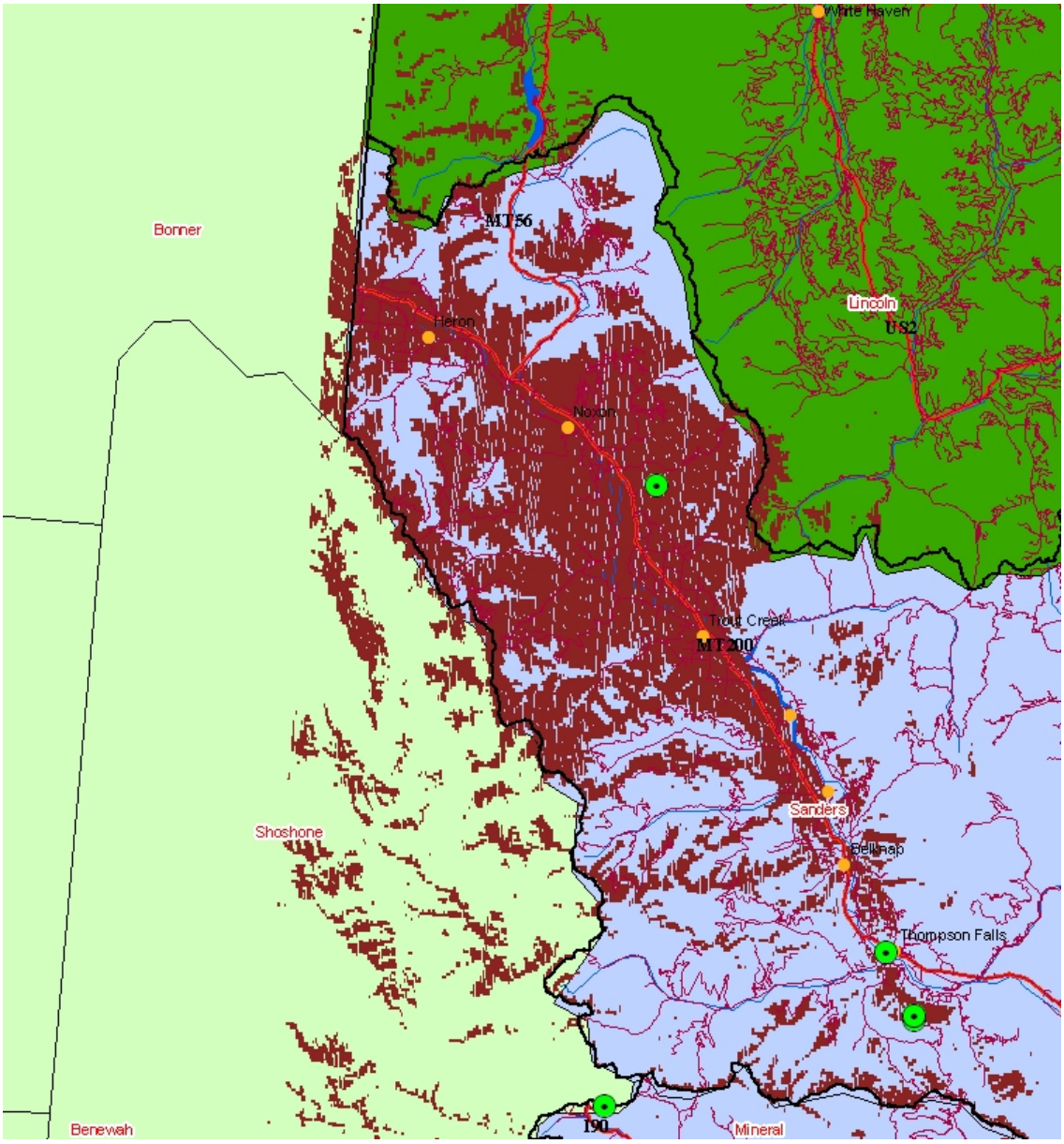

Figure 23 – Coverage Map: Green Mountain

5.4.8 Oliver

Site Pictures

Online picture not available, refer to Appendix D.

Site Description:

The tower on this site is not high enough to support additional antennas.

Area:

This site is 10 miles east of Hot Springs, Montana

Owner:

Confederated Salish & Kootenai Tribe

Elevation:

4257 ft.

Latitude:

47 37.274

Longitude:

114 25.604

Tower:

Free standing, 20 ft., fair condition

Building Type:

Wood frame, metal roof

Building Size:

10’x12’

List of Users at this site:

- Sanders County Sheriff's Office
- Confederated Salish & Kootenai Tribe
- United States Department of Agriculture

Radios at this site:

- GE Master II SN 0452203 BIA 2-31963 Comb: DI66T7466A
- Motorola Quantar Model: T5365A SN 224STU0123
- Motorola MOT9000 Link Radio
- Motorola Quantar Model T5365A SN 509CDV0016

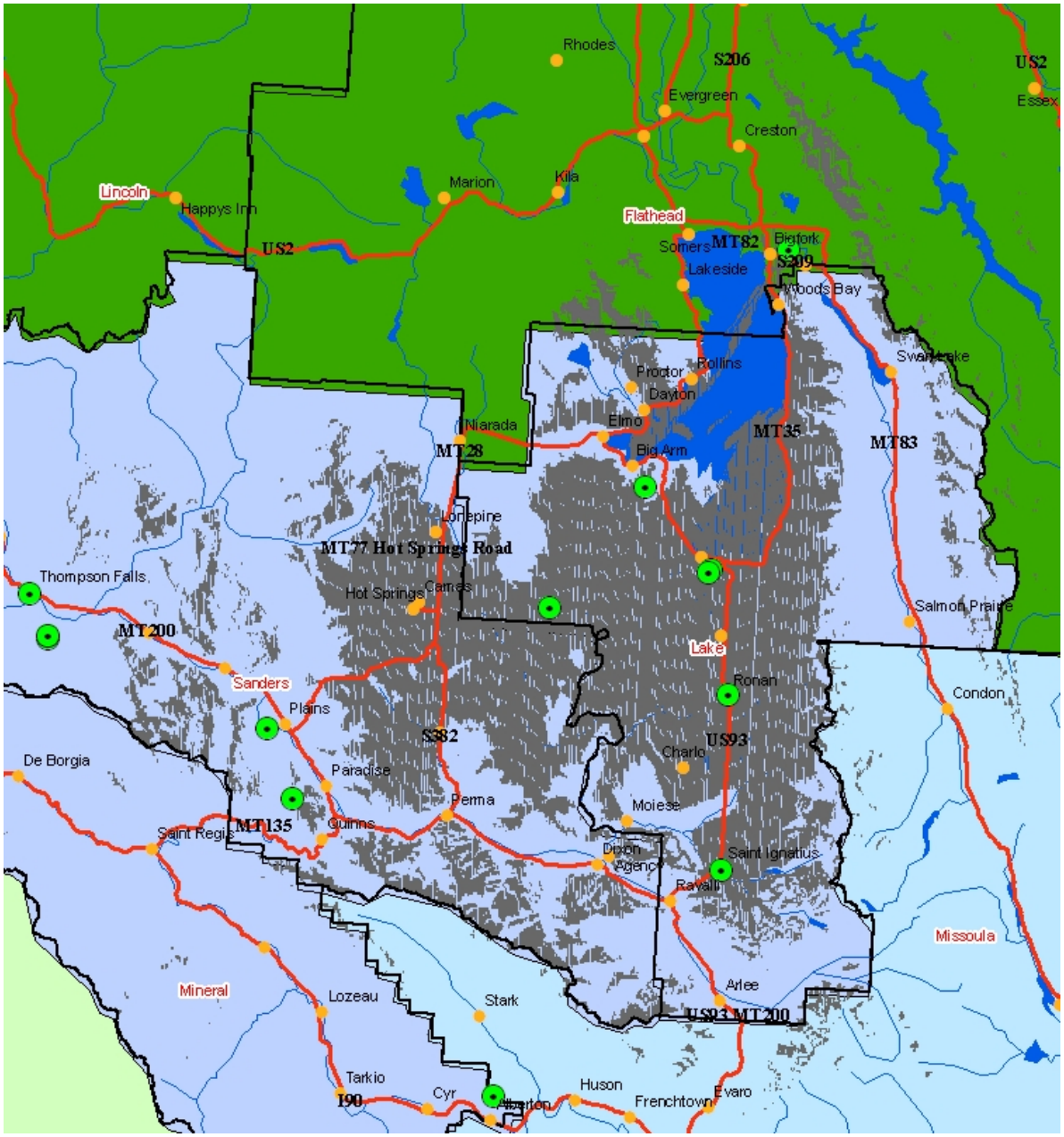

Figure 24 – Coverage Map: Oliver

5.4.9 Andrews Creek

Site Pictures

Site Description:

The site is in a good location with easy access. The site is lacking adequate grounding systems. Some wet cell batteries are present in the equipment room. These batteries have leaked inside the structure and gases from the battery acid may be present inside the building and impregnated on items within the building. The interior of the building had an odor of sulfuric acid on the day of the inspection. Prior to any modifications or additions to this site, it would be prudent for the removal of all wet cell batteries and decontamination of the building to occur.

Area:

This site is approximately 6 miles from US Highway 93.

Owner:

Tower/Structure Owner: Sula TV District
Landowner: US Forest Service

Elevation:

1923.29M

Latitude:

45 49 17.5

Longitude:

113 49 41.2

Tower:

Light duty tower, approximately 40-50 ft

Building Type:

Concrete foundation, cinderblock walls, wood truss roof with sheet metal roofing

Building Size:

81”x104”

List of Users at this site:

- Sula TV District
- Sula Fire Department

Radios at this site:

- (2) Motorola Radius M1225 w/RICK
- RELM Model RIBR
- (2) Sula TV Translator

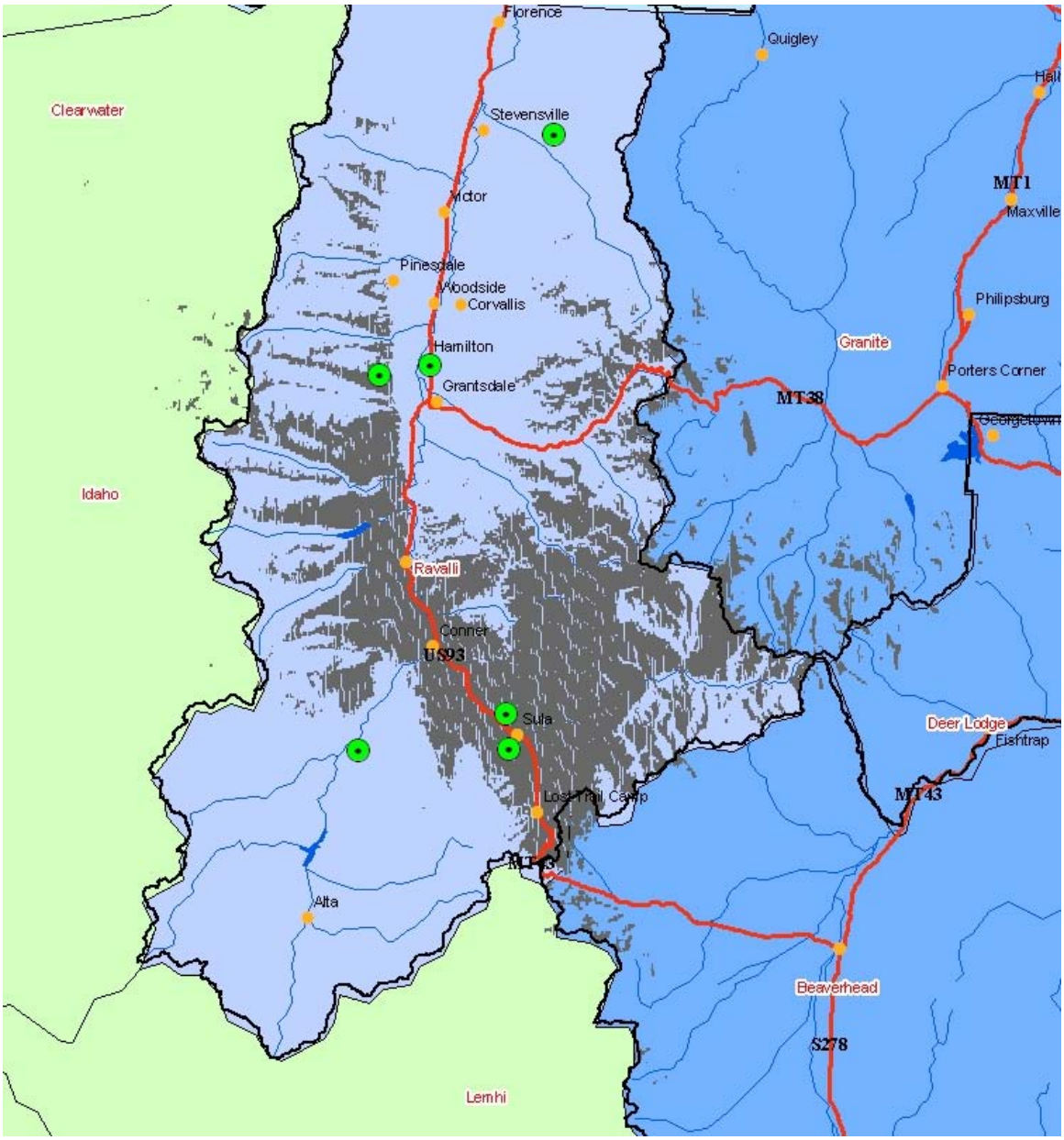

Figure 25 – Coverage Map: Andrews Creek

5.4.10 Downing Mountain

Site Pictures

Site Description:

This site is not in used at this time for public safety radio communications. The site is co-located with the "Grubstake" restaurant on Downing Mountain. The area around the site is cluttered with debris and the final leg of the access road is narrow and steep. There are no provisions for backup power at the site other than for the buildings and towers housing the cellular phone equipment. The main site building and shelters for microwave dishes are in poor condition. Further evaluation and planning will be necessary if this site is to be considered for use in a public safety communication network.

Area:

This site is approximately 7.6 miles from the intersection of First (US Highway 93) and Main in Hamilton.

Owner:

Richard Kingdon

Elevation:

1691.03M

Latitude:

46 13 47.8

Longitude:

114 14 10.6

Tower:

Guyed tower, Rohn 45-type, approximately 75-100 ft, good condition

Building Type:

Modular metal structure resting on railroad ties

Building Size:

83”x171”

List of Users at this site:

- Verizon, Western Wireless
- University of Montana
- Faith Communications
- Rocky Mountain Internet
- AirTel
- Montana Highway Patrol MDT System
- Montana Wireless TV
- Bitterroot Amateur Radio Club
- Amateur radio packet system

Radios at this site:

- Faith Communications 90.3 FM
- Montana Wireless TV System
- Dataradio MDT System
- GE MASTER II 40w repeater
- Amateur radio packet system

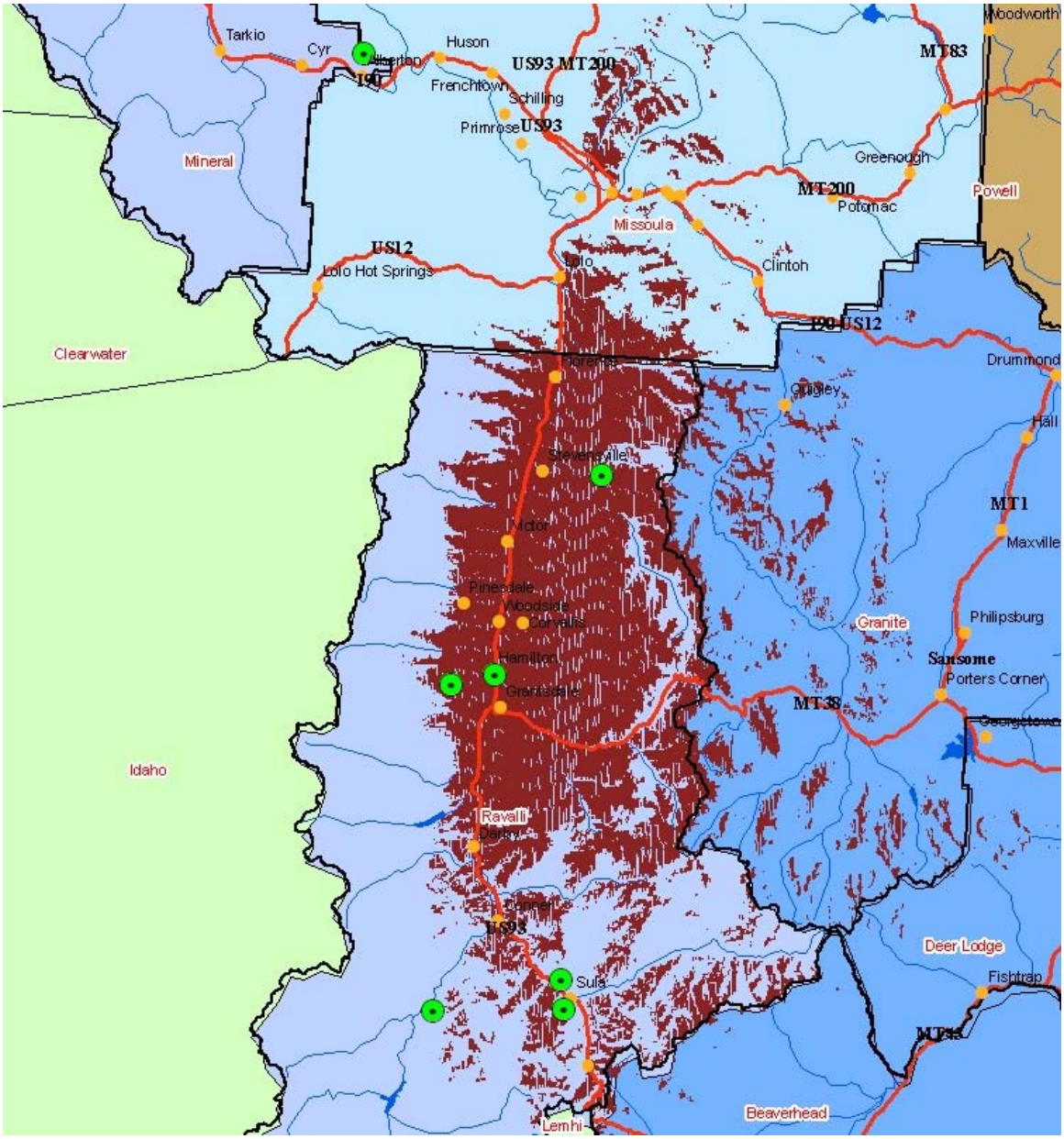

Figure 26 – Coverage Map: Downing Mountain

5.4.11 Reed Butte

Site Pictures

Site Description:

This is a recently constructed site within the past ten years. The site is constructed to Motorola R56 standards.

Area:

Eastside Highway (MT-Secondary 203) - Ambrose Creek Road – Sunnyside Cemetery Road near Stevensville

Owner:

SatComm Support, L.P.

Elevation:

1443.23M

Latitude:

46 30 34.6

Longitude:

113 58 46.8

Tower:

Guyed tower, 190 ft., excellent condition
Free standing, 80 ft, excellent condition

Building Type:

Concrete foundation, stud frame construction, siding, sealed and weatherproofed

Building Size:

144”x168”

List of Users at this site:

- Verizon
- Western Wireless
- Rocky Mountain Internet
- AirTel
- Cybernet 1 Internet
- Montana Highway Patrol MDT System, Ravalli County Sheriff's Office
- Three Mile Volunteer Fire District
- Montana Wireless TV
- Bitterroot Amateur Radio Club
- Fisher Communications

Radios at this site:

- Fisher Communications 98.7 FM
- Rocky Mountain Wireless Internet System
- Dataradio MDT System
- Cybernet 1 Wireless Internet System
- Montana Wireless Television System
- GE MASTER II 110w repeater
- (2) Motorola Quantar, 125w

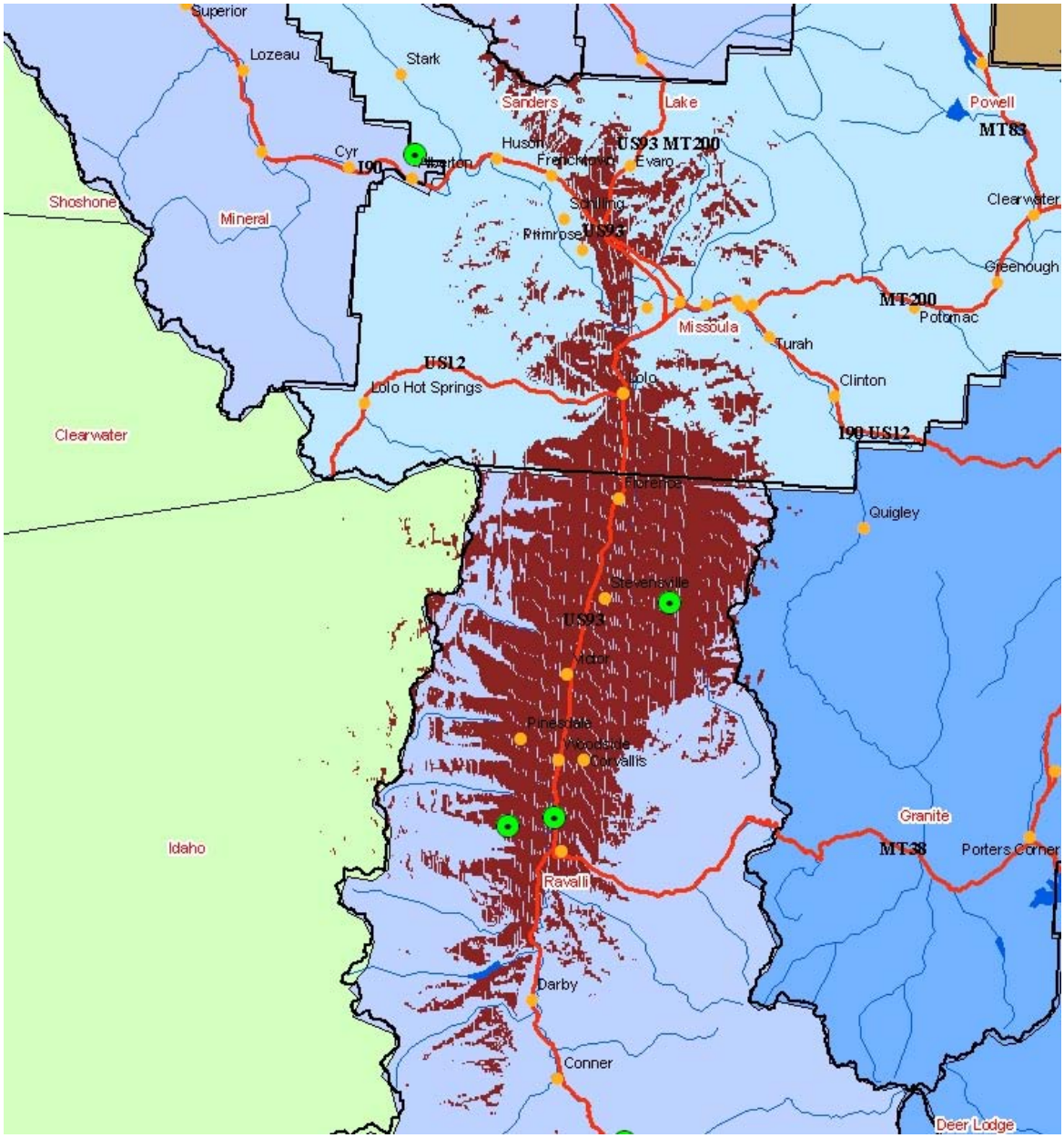

Figure 27 – Coverage Map: Reed Butte

5.4.12 Steep Creek

Site Pictures

Site Description:

The site is in a good location to provide coverage for the majority of the MT-Secondary 473 (West Fork Road) area.

Area:

This site is approximately 11 miles from MT-Secondary 473 (West Fork Road).

Owner:

U.S. Forest Service

Elevation:

1691.64M

Latitude:

45 48 35.0

Longitude:

114 14 04.0

Tower:

Wooden pole, 50ft. fair condition

Building Type:

Concrete foundation and floor, cinderblock walls, wood trusses and sheet metal roof

Building Size:

80”x80”

List of Users at this site:

- US Forest Service
- Ravalli County Sheriff’s Office
- West Fork Volunteer Fire District
- Ravalli County Road Department
- Ravalli Electric Co-Op

Radios at this site:

- Daniels Electronics, amplifier model # AMP-2/170/3000
- (8) Motorola Radius M1225 with RICK

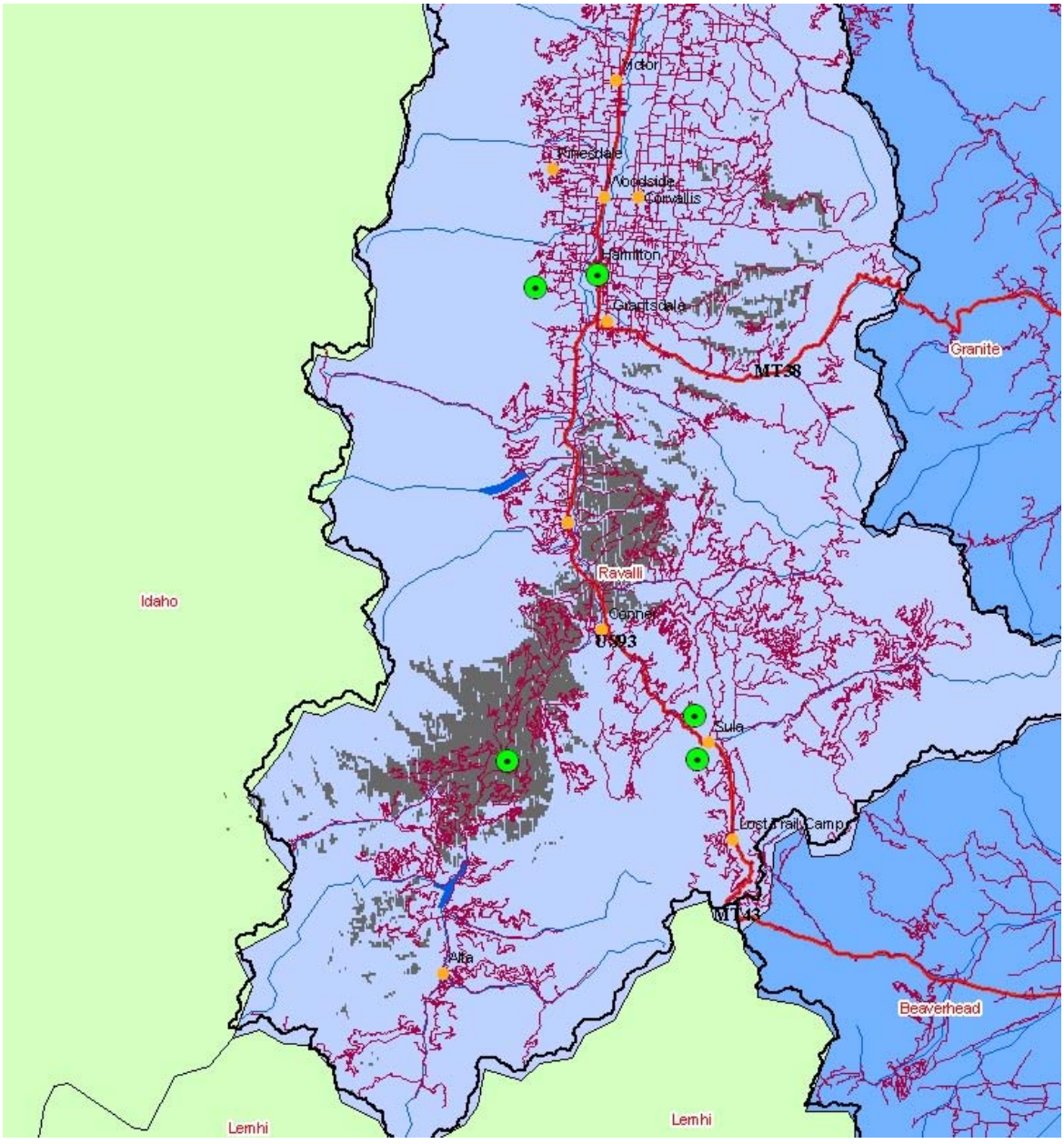

Figure 28 – Coverage Map: Steep Creek

5.4.13 Sula Peak

Site Pictures

Site Description:

This site is in a good location with easy access. The site is clear of debris and obstructions. Microwave systems can be installed at this site with minimal effort. Some wet cell batteries are present in the equipment room. There is plenty of space in the building for additional equipment. The generator at the site was recently installed and powers the entire site building. Future site plans include replacement of the Sheriff Repeater with a Motorola Quantar (2005).

Area:

This site is approximately 3.5 files from US Highway 93.

Owner:

Tower/Structure Owner: Hickman Sites
Landowner: U.S. Forest Service

Elevation:

1875.74M

Latitude:

45 51 34.0

Longitude:

114 00 06.9

Tower:

Wooden pole, free standing, approximately 25-30 ft., good condition
Wooden pole, free standing, approximately 35-40 ft., good condition
Rohn 25-type tower, attached to side of building, approximately 25-30 ft., good condition

Building Type:

Concrete foundation, wood floor, stud walls with plywood interior, sheet metal siding and roof

Building Size:

136”x136”

List of Users at this site:

- US Forest Service and Montana Highway Patrol at nearby lookout tower
- Ravalli County Sheriff’s Office
- Ravalli Electric Co-Op
- Montana Department of Transportation
- FBI
- Verizon
- Montana Highway Patrol MDT System
- Montana Electronics & other paging systems

Radios at this site:

- FBI Equipment
- Paging Transmitter
- Paging Transmitter
- GE MASTER II 110w repeater
- (2) Motorola Radius M1225 with RICK
- (2) Motorola Radius M1225 with RICK
- Dataradio MDT System

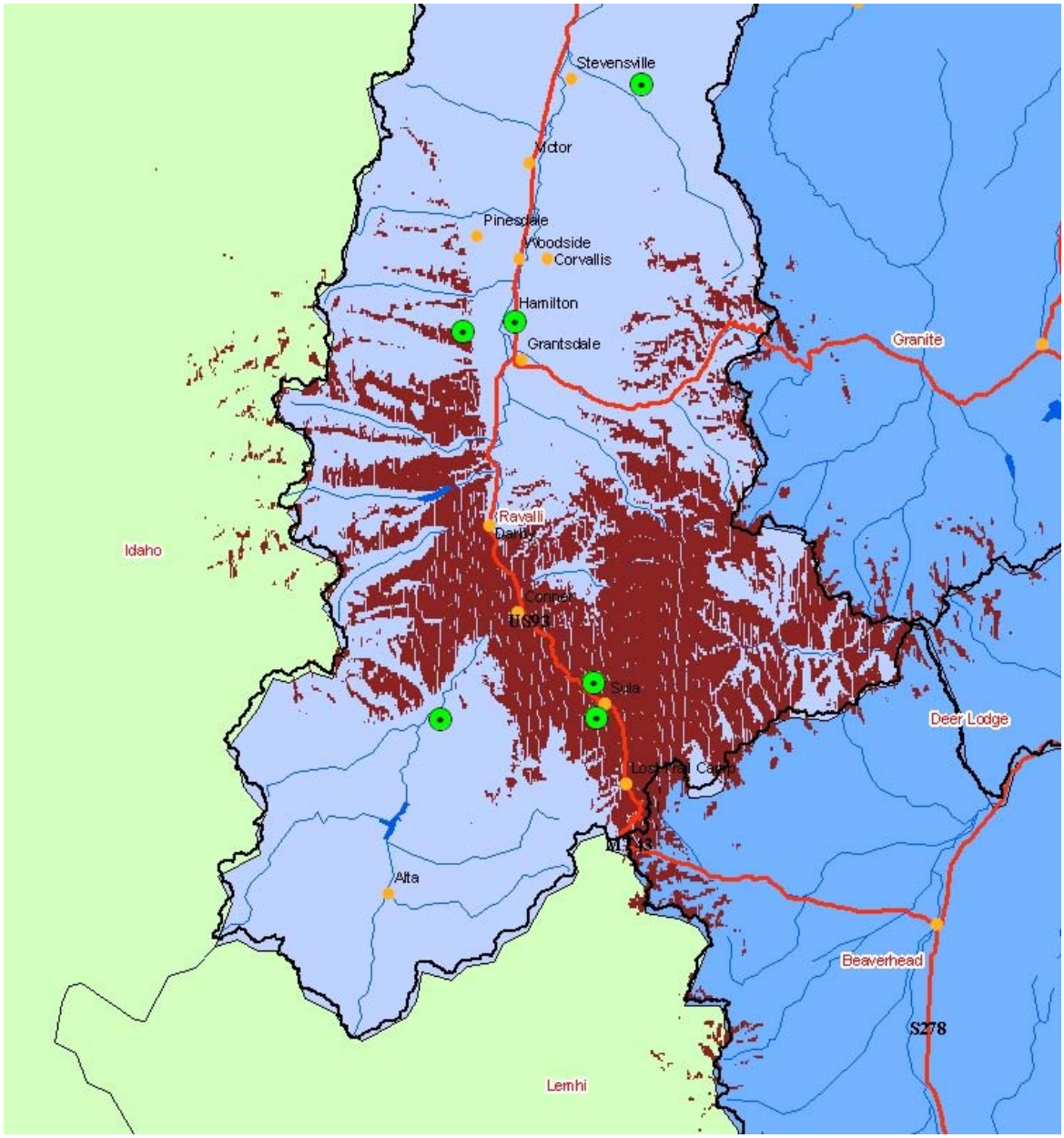

Figure 29 – Coverage Map: Sula Peak

5.4.14 Ronan

Site Pictures

Online picture not available.

Site Description:

This site is housed at the telephone company.

Area:

This site is located in the Telco building.

Owner:

Ronan Telephone Company

Elevation:

3062 ft.

Latitude:

47 31.784

Longitude:

114 05.934

Tower:

Free standing, 100 ft., good condition

Building Type:

Block

Building Size:

Not provided

List of Users at this site:

- Telco
- Lake County

Radios at this site:

- Motorola GR1225 Repeater

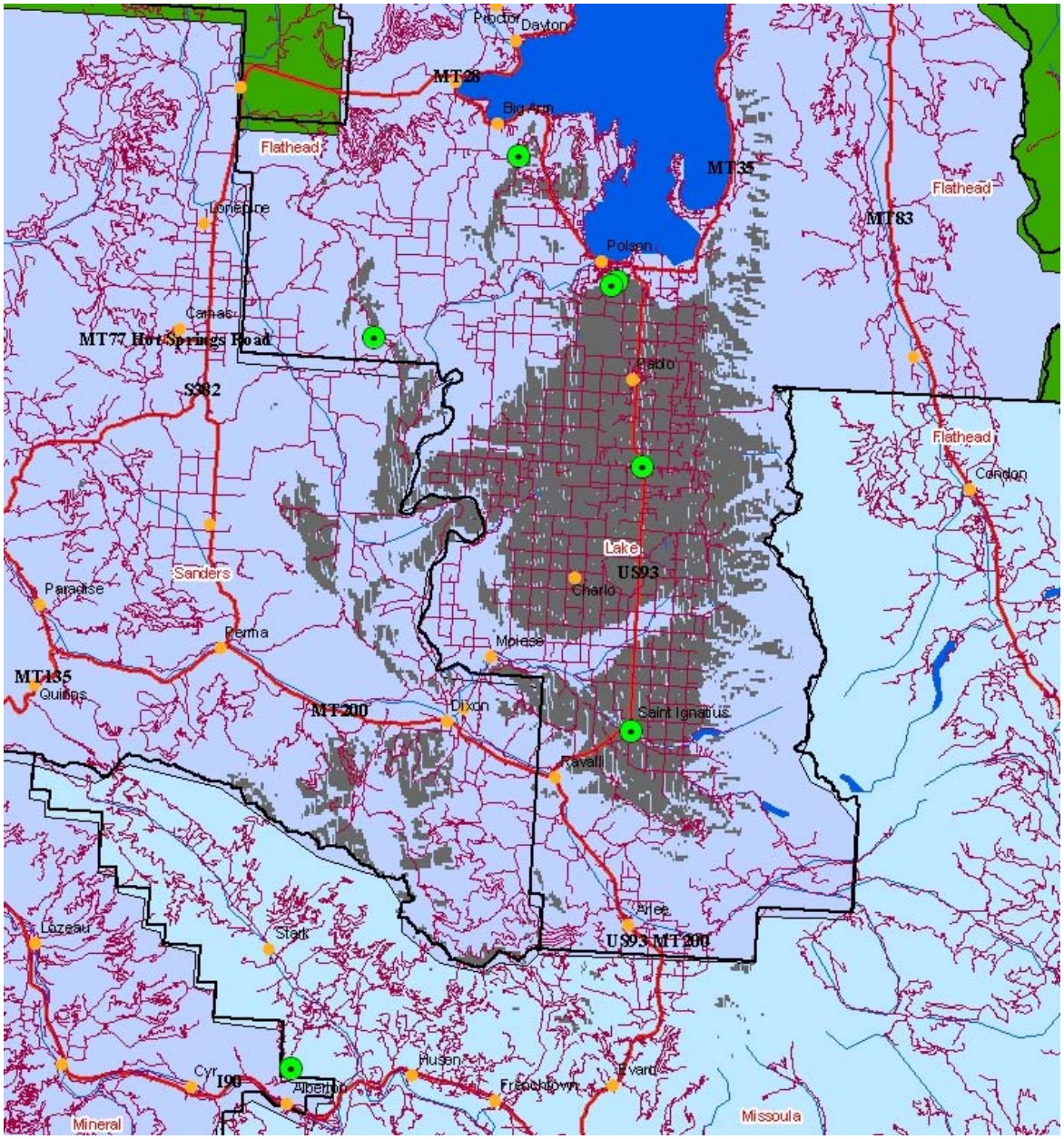

Figure 30 – Coverage Map: Ronan

5.4.15 St. Ignatius

Site Pictures

Online picture not available.

Site Description:

This site is housed at the police station.

Area:

Police Department

Owner:

City of St. Ignatius

Elevation:

2945 ft.

Latitude:

47 19.085

Longitude:

114 05.694

Tower:

No tower

Building Type:

Cement

Building Size:

Not provided

List of Users at this site:

- Police Department

Radios at this site:

- Motorola GR1225 Repeater

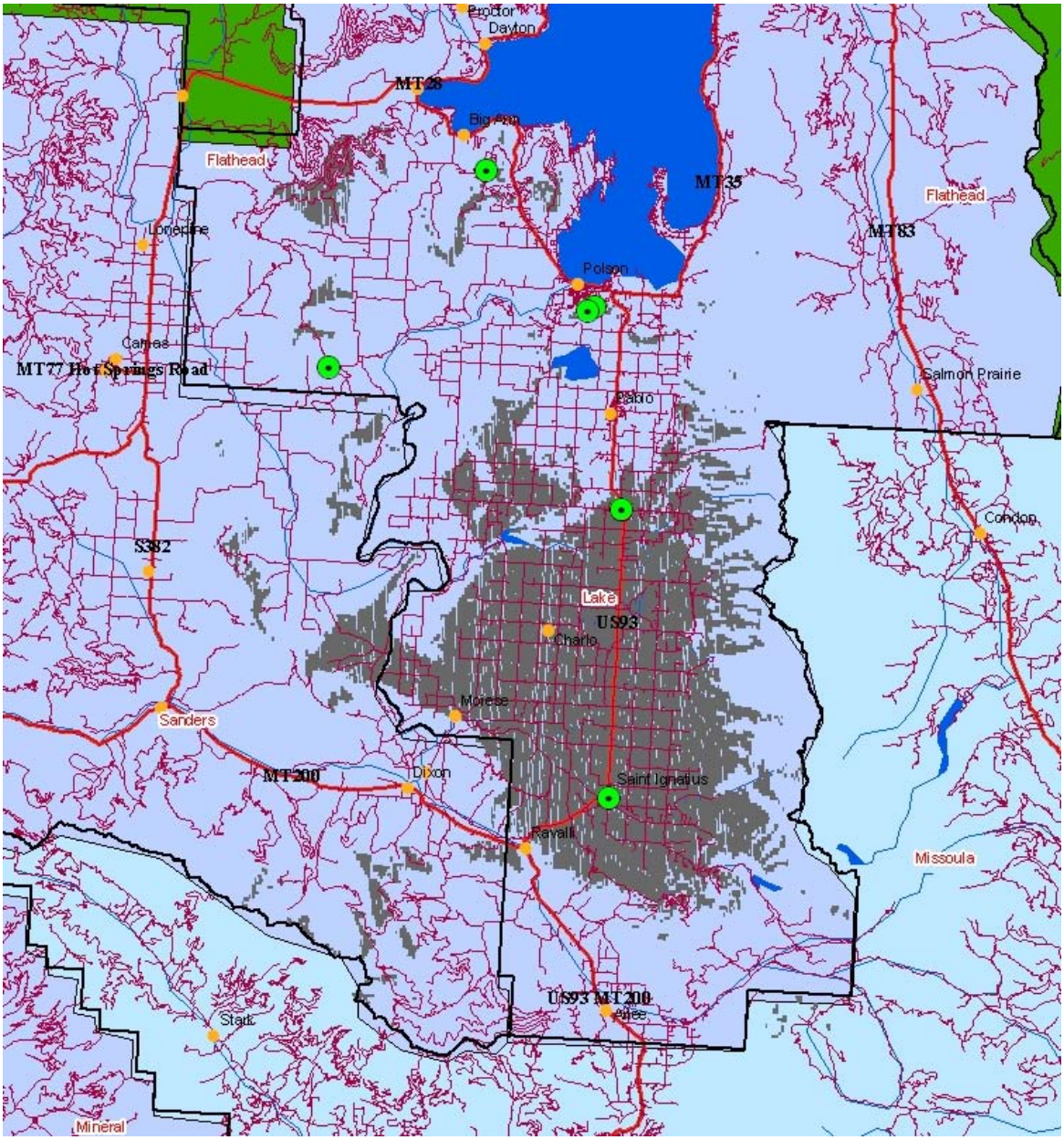

Figure 31 – Coverage Map: St Ignatius

5.4.16 Swan Hill

Site Pictures

Online picture not available.

Site Description:

The building on this site has 80% space available for use.

Area:

Swan Hill in Big Fork, Montana

Owner:

Lake County

Elevation:

3714 ft.

Latitude:

48 04.079

Longitude:

114 02.380

Tower:

Guyed, 40 ft., fair condition

Building Type:

Cement

Building Size:

9’6”x15’6”

List of Users at this site:

- Lake County Sheriff
- Lake County Land Services
- Flathead County Sheriff

Radios at this site:

- Base MDL MSR 20000 (Motorola)
- Motorola CDM 750
- Base MSR 2000 Motorola
- Motorola Radius GR300

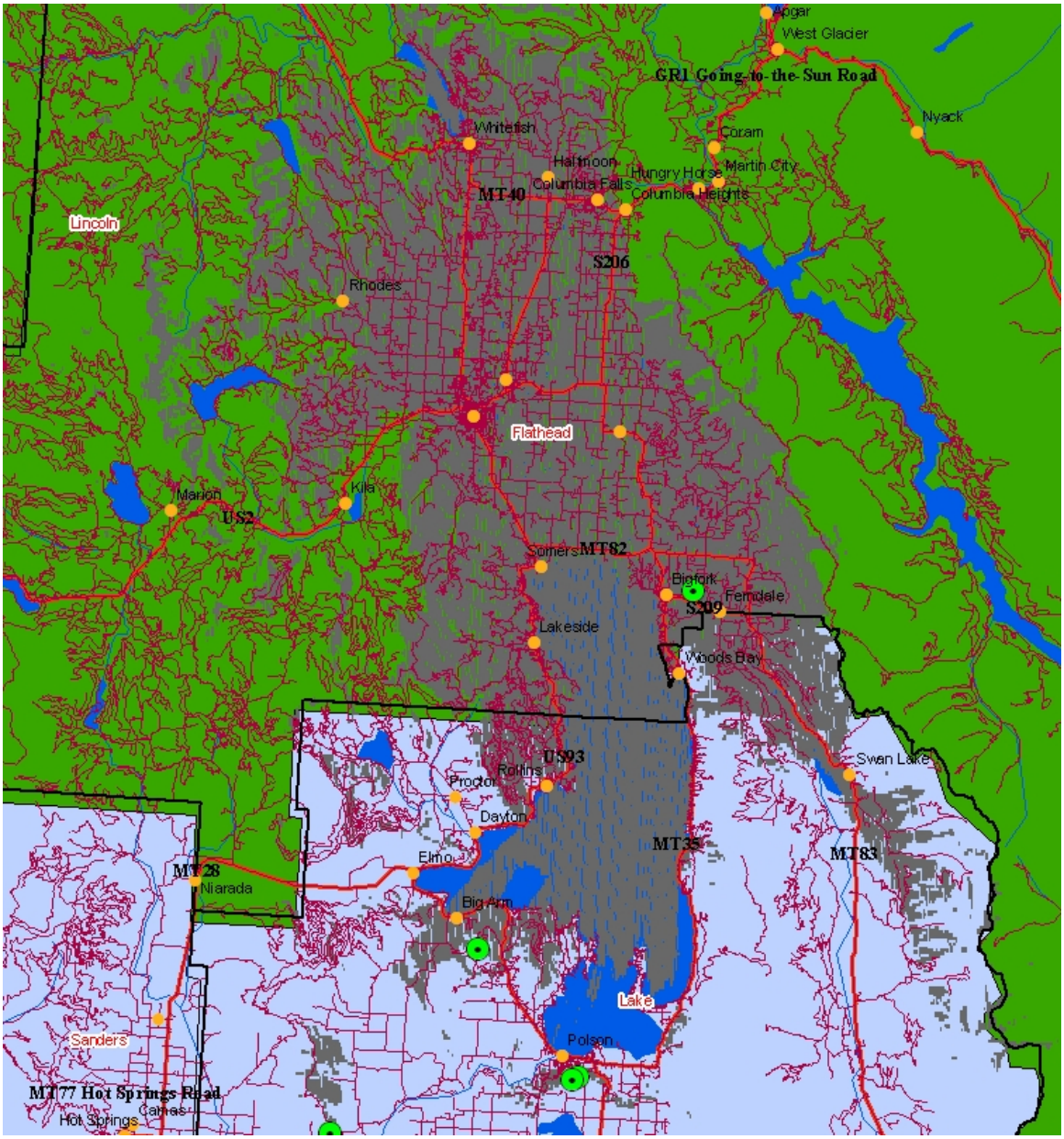

Figure 32 – Coverage Map: Swan Hill

5.4.17 Polson Hill South

Site Pictures

Online picture not available.

Site Description:

The building on this site has 70% space available for use.

Area:

Polson Hill in Polson, Montana

Owner:

Lake County

Elevation:

3420 ft.

Latitude:

47 40.483

Longitude:

114 08.933

Tower:

Guyed, 45 ft., good condition

Building Type:

Concrete

Building Size:

15’5”x9’4”

List of Users at this site:

- Lake County Sheriff
- BIA (Safety of Dams)

Radios at this site:

- Motorola MSR 2000
- Motorola CDM 1550
- Motorola GM 300
- Motorola MTR 2000

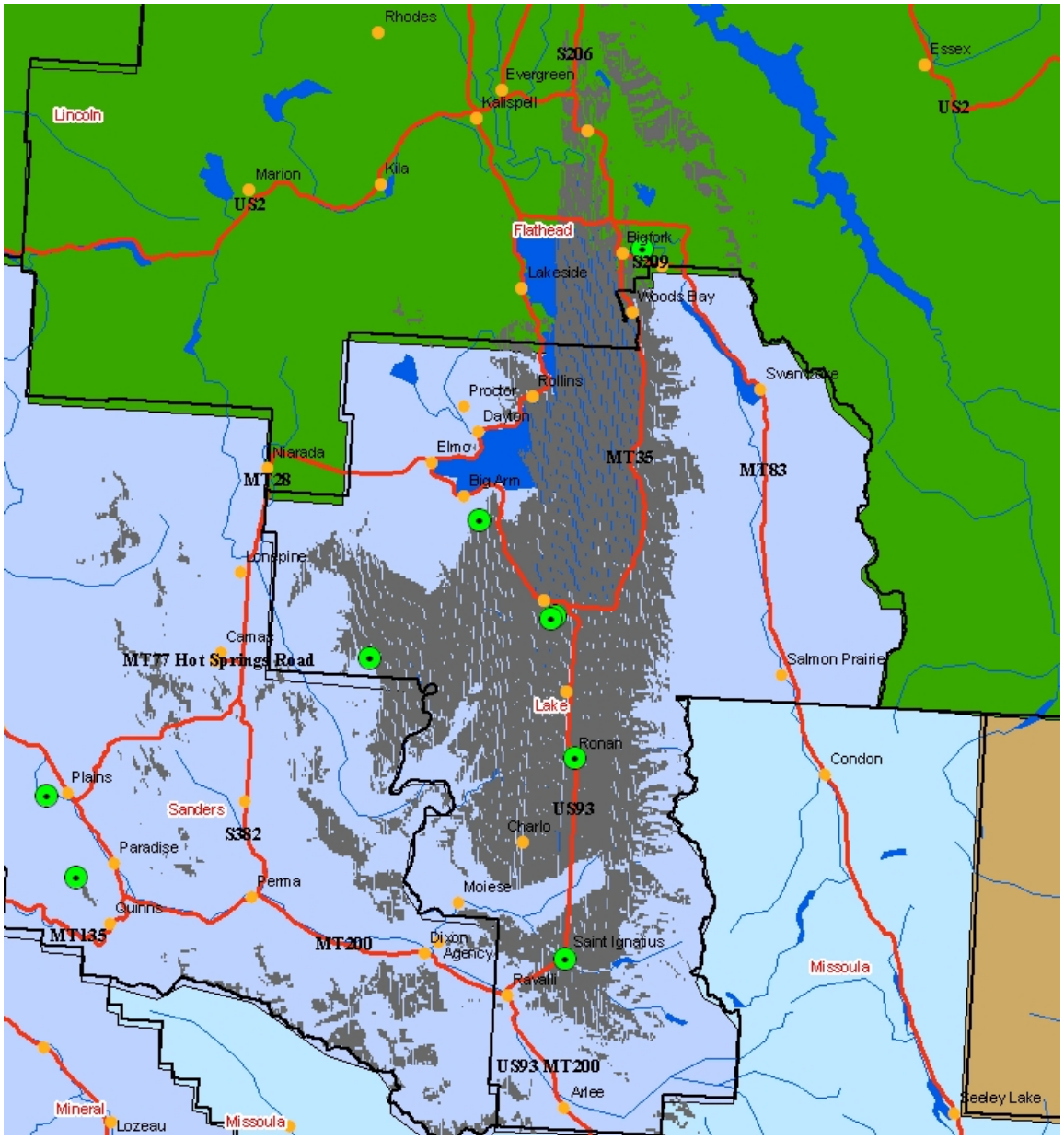

Figure 33 – Coverage Map: Polson Hill South

5.4.18 Polson Hill North

Site Pictures

Online picture not available.

Site Description:

There is no tower at this site.

Area:

Overlook city of Polson, Montana on Polson Hill

Owner:

Mission Valley Power

Elevation:

3417 ft.

Latitude:

47 40.687

Longitude:

114 08.53

Tower:

No tower

Building Type:

Concrete

Building Size:

8’2”x8’

List of Users at this site:

- Mission valley Power
- L.C.S.O.

Radios at this site:

- Motorola MTR 2000

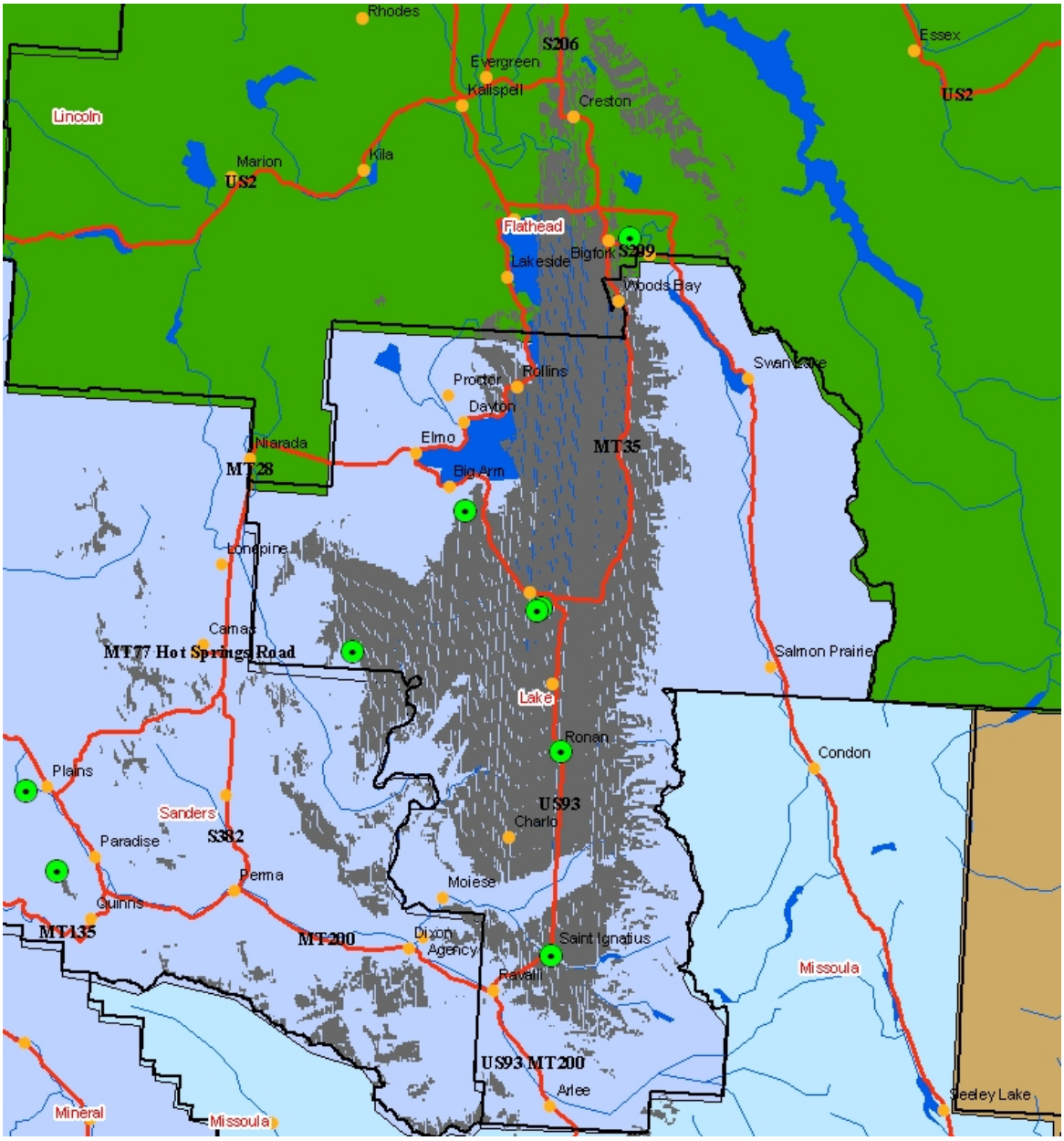

Figure 34 – Coverage Map: Polson Hill North

5.4.19 Jette Point

Site Pictures

Online picture not available.

Site Description:

No tower exists at this site for county equipment.

Area:

Jette Point/Hill NW of Polson, Montana

Owner:

Not provided

Elevation:

5199 ft.

Latitude:

47 46.415

Longitude:

114 16.126

Tower:

No tower

Building Type:

Concrete

Building Size:

30’4”x40’

List of Users at this site:

- Multiple Commercial
- Private
- Broadcasting
- Cell
- Microwave

Radios at this site:

- Motorola MSF Limited 5000
- Motorola MSF 5000

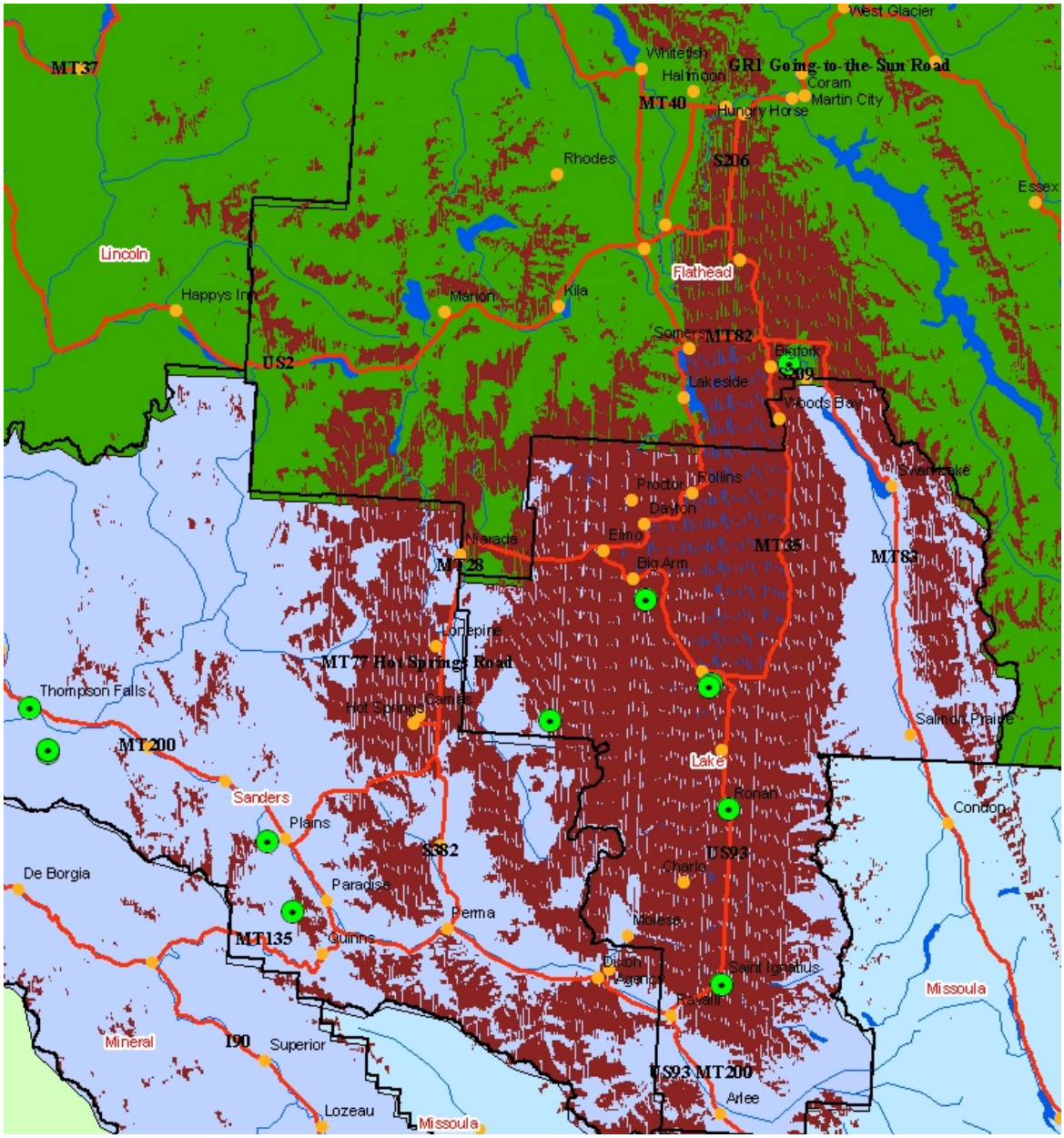

Figure 35 – Coverage Map: Jette Point

5.5 Detailed Recommendations

Overall project success depends on the ability to demonstrate success on an iterative basis throughout the life of the project. Project tracking and reporting to show where success has occurred will build support for the project, not only stakeholder support, but also financial support.

Working collaboratively within the consortium and with others throughout the state will bring about the most effective plan, design and implementation of a system, not only for WICC but also for the other consortia and the state/region as a whole.

5.5.1 Funding and Resources

It is critical for the success of this project that additional funding and resources be identified and pursued. Funding is near the top of the list of concerns for every agency in WICC. A potential obstacle to a new system is cost, both in terms of equipment acquisition and on going maintenance and perceptions of it. Most users were aware of the potential costs of a next generation system and seemed skeptical of the value especially when the cost of the next generation equipment is more expensive than the cost of wide band conventional equipment.

Every day support for interoperable communication is growing. There are articles in newspapers and on television, which in turn seem to launch bills in congress and local government to improve interoperable communications. The country is further recognizing the need and importance of emergency responders being able to communicate with each other.

At the time of this writing, the project has only one revenue source: DES or Homeland Security Grants. Additional funds would allow for further work into various steps of the strategy. The following is a list of potential funding sources:

- Federal Emergency Management Agency (FEMA) – ICE Grants
- Homeland Security - WMD
- DPHHS - EMS
- Fire Grants
- National Guard
- Highway Traffic Safety
- Transportation (Montana Department of Transportation)
- Legislature
- Congress

Other sources may be out there. Each discipline has more knowledge in their specific area.

There is concern throughout the consortium regarding how the available 2005 ODP funding will be allocated. This concern has presented itself with various agencies feeling that they have certain needs that need to be addressed before others in the consortium. This will need to be handled at the consortium board level and will not be easy to manage. Additional funding will make this easier to manage.

The consortium will need grant funds to replace much of its equipment but each county or agency should also develop a capital improvements plan and set aside as many dollars as it can afford from various revenue sources, such as Payment in Lieu of Taxes (PILT), or general taxes. Local dollars may be needed to provide matching funds for grants or to fund items that a grant will not pay for, such as construction in the case of Homeland Security Grants.

5.5.2 Formal Communication Plans

To improve interagency communications, it is important for all agencies to establish formal communication plans. Almost all agencies have various neighboring law enforcement, fire and EMS frequencies programmed into their radios now. However almost no one has a formal communication plan to be able to verify what is programmed and what is not.

Local and inter-county interoperable communications are dependent on each party having the other's frequencies programmed into their radios. This type of coordination is critical for everyone in a region to be able to communicate effectively. It is also important that the collaboration on frequencies is formally documented through a memorandum of understanding.

In particular, it is critical that local and county agencies work with DNRC and Forest Service to ensure that the local/county agencies have coordinated with the narrow band frequency migration that is underway. WICC should develop conventional frequency plans until a more advanced mechanism is available. This plan would include conventional frequencies and mutual aid channels.

This is also a scenario that would benefit from a centralized information system, ideally a database, accessible by each agency to coordinate frequencies and radio programming.

A single point of responsibility, (i.e. a central, responsible person) to:

- ensure radio frequencies are correctly programmed into radios
- ensure radio sites are properly maintained
- research radio technology and recommend standards for radio purchases
- develop frequency plans
- review business practices to insure interoperability
- coordinate training for system users

The Consortium should work on developing a well-accepted communication channel plan for the conventional system as a preliminary step, while waiting to deploy a new system. Mutual Aid

(State Color channels) are used for interoperability but these sometimes fall short because coverage is limited to simplex communications. Where the topography of the county is better served by repeated channels a strategy to share repeater during an emergency should be developed. Existing plans are limited to agencies within a county, plans to provide interoperability across the consortium is needed.

Another area that will require formal communication plans will be with private ambulance companies. There are several operating in or near the consortium as well as around the state. A plan needs to be developed, potentially through DPHHS, on how to deal with that aspect of radio communication system.

5.5.3 Business Practices and Training

One third of responders considered the area of business practices and dispatch practices to be of critical importance to communication improvements in the consortium. Formal business process review and documentation should start at the beginning of the next phase. This process can be very time consuming so it is important to allow time in the schedule for these activities.

Training should be provided to all levels of radio users on the following topics:

- Radios
- Procedures
- Dispatch
- Trunking

Dispatch is a central aspect to radio communications and can be a bottleneck in communications when multiple incidents are being managed. This topic has been included in the process and training section as many of the problems that occur with dispatch can be addressed through business practices and training on those practices.

Lewis and Clark County will be a great resource to help establish training criteria and methods. Other states can be looked to for help in this area. Utah and Alaska may very well have been through these same steps recently.

5.5.4 Centralized Project and Frequency Management

It is the recommendation of Northrop Grumman that the next phases of this, as well as other ICPs, be managed through a centralized Project Management Office (PMO). It will be critical to clearly define the role and responsibilities for this entity.

Project management is key to ensuring that site selection and development serves multiple consortia. Centralized project management will provide cost containment and cooperation that will result in lower costs.

Additionally this PMO could be the location for frequency management issues. A lack of VHF high band spectrum to further expand the system (adding new radio channels) is a potential

obstacle to deployment of a new system. Frequency licensing of needed spectrum should be a priority.

5.5.5 Board of Project Directors

The Board is still defining their role as "directors" for the statewide effort. This role seems to be a logical place to formalize procedures on how all the consortia work together. Collaboration is the key to success and will maximize the benefits from dollars spent.

Project management is key to ensuring that site selection and development serves multiple consortia. Centralized project management will provide cost containment and cooperation that will result in lower overall costs.

The company providing project management would be a logical location for managing or coordinating frequency issues as well.

5.5.6 Inventory Standards

There is no standard in effect for inventory and most agencies do not maintain a formal inventory file. Most grants will require property management standards and records to be kept for verification. Property records should be centralized to the maximum extent possible along with finance records. A physical inventory should be taken bi-annually, on at least a random selection basis, to verify the equipment exists, what its current use is, and the need for the equipment. Control system(s) should be in place to prevent loss, damage, theft, etc. A method of tagging each item of equipment should be implemented.

Property records should be maintained to include the following equipment data:

1. Description (nomenclature)
2. Serial Number
3. Acquisition Date
4. Acquisition Cost
5. Source
6. Percentage of Federal Funds
7. Location use
8. Condition
9. Disposition Data (when taken out of service)
10. Sales Price
11. Fair Market Value

If a statewide equipment reallocation strategy is adopted, a full equipment inventory database would be the best solution. Other state agencies may have equipment-tracking databases that could be looked to for a model.

5.5.7 Paging

Paging related issues accounted for 26% of what responders felt was an important communications improvement. Paging was not considered to be within the scope of work for interoperable communications so no preliminary design work was done in that area. The issue should be addressed in each county and region to come up with specific improvements for those responders.

5.6 Preliminary Design

The system implementation will have to be taken in phases unless a significant revenue source is found. In order to allow for many funding sources, an overall implementation strategy has been devised. This is broken down into two sections: field units and site development. The implementation strategy is broken down into 3 phases or stages that are based on funding, not time.

Phase 1: Set the Stage - Radios and Site Upgrades
This stage of the project is to ensure that basics standards are met in regard to site conditions and capabilities, which will make sites "microwave ready". It is also the stage for upgrading certain radios, both repeaters and field units.

Phase 2: Add Trunked Sites at each County Seat
The second stage adds microwave and trunking capabilities to sites overlooking counties seats, which are significant population centers, as well as dispatch centers.

Phase 3: Upgrade Additional Sites to Trunking Where Needed
This stage is where the system will go if the consortium has the funding necessary to build out a system that will satisfy the needs of everyone involved.

5.6.1 Field Unit Upgrade Strategy

At the onset of the project, significant resistance to the entire project was based on concern over the costs for subscriber units. In several county meetings, users brought up costs for new trunking subscriber units in the $5000 range, compared to conventional pricing at less than $1000. Since that time, vendor competition has increased, and thus the cost for subscriber units has come down considerably. This will continue, as has been the case with all new electronic equipment. At the time of this writing, a base subscriber unit that is trunking upgradeable can be purchased for less than $1000. However, there are units with advanced features that can push the $5000 range. It all depends on the features that are added to the unit.

The recommended strategy for upgrades to field units is a resource reallocation approach referred to as the "Trickle Down Strategy". The sequence of reallocation is determined by the Incident Command Systems (ICS) structure. Since the initial funding source is requiring P25 trunking capable units be purchased with grant funding, it is recommended that command and control level users be provided with new units first, with Commanders receiving encrypted radios.

The following table lists category levels which radios fall into that will help explain the types of field units out there and how they can be upgraded and used based on the ICS.

Field Unit Level	Description	Minimum Standard
Category 1: P25 – Trunking Capable	P25 Trunking Capable	Deploy based on the ICS Command Structure first
Category 2: P25 – Conventional (Existing)	P25 Conventional (Non-Trunking)	Phase out third
Category 3: Newer	Narrow band conventional	Phase out second
Category 4: Old	Wide bank conventional	Phase out first
Encryption added to Category 1 Radios for ICS commanders and other users as decided at the consortium level – Encryption key(s) designated for statewide use carried in all radios.		

Figure 36 – Field Unit Upgrade Strategy

Using this strategy, serviceable Category 2 and 3 radios can be redistributed to replace Category 4 radios until all Category 4 radios are out of service. Then Category 3 radios are phased out and finally Category 2 radios are phased out.

For example, Sheriff with category 3 radio passes this radio to replace a Category 4 radio and receives a new Category 1 radio.

This approach will help to ensure that all radios become narrow band in time for the changes that will be mandated by the Federal Communications Commission (FCC). This same strategy can be used with repeaters, base stations and even towers.

Specifically it is recommended that fire remain as is, with the exception of command and control until a complete system is operational. The consortium needs to prioritize the remaining functional areas of law enforcement, EMS, DES and public works.

It would be beneficial to all to develop an approved equipment list based on the Western States Contracting Alliance (WSCA) contract. For more information, go to the website http://www.aboutwsca.org/.

As a final note on field units: It is becoming increasingly clear that the 2013 date for all units to be narrow band is not the date to look at. As the Forest Service and DNRC upgrade radios to narrow band in the coming year, all agencies that interface with them will need to narrow band, preferably before the next fire season.

5.6.2 Site Upgrade Strategy

The following table lists each of the sites in the consortium and the general upgrade path for the site. Each sites upgrade path is determined by current coverage and fundamental site conditions: power, building, tower, etc. The goal is to select sites that can fit together in a trunked system with overlapping coverage. Other sites will remain conventional based on available funding. The upgrade plan incorporates adding repeaters to the existing system to improve coverage and interoperability in all counties in the consortium.

Mineral	Lookout Pass	Upgrade to Trunked site
	Ellis Mountain	Upgrade to Trunked site
	Thompson Peak	Keep Conventional
Sanders	Clarks Peak	Upgrade to Trunked site
	Clarks Peak/Hickman Sites	Keep Conventional
	Patricks Knob	Upgrade to Trunked site
	Green Mountain	Upgrade to Trunked site
	Oliver	Keep Conventional
Ravalli	Andrews Creek	Keep Conventional
	Downing Mountain	Upgrade to Trunked site
	Reed Butte	Upgrade to Trunked site
	Steep Creek	Keep Conventional
	Sula Peak	Upgrade to Trunked site
Lake	Ronan	Keep Conventional
	St. Ignatius	Keep Conventional
	Swan Hill	Keep Conventional
	Polson Hill North	Keep Conventional
	Polson Hill South	Keep Conventional
	Jette Point	Upgrade to Trunked site (Northern Tier is planning to upgrade this site)

Figure 37 – WICC Site List

Geographic areas for coverage improvement are listed below:

- Mineral County: West of St. Regis to De Borgia on Interstate 90.
- Sanders County: East end of the county.
- Ravalli County: South Valley.

5.6.3 Site Development Cost Estimate

This section contains a summary of the costs per site of the preliminary design and a total for the consortium. The following data is also contained in a spreadsheet in Appendix A.

The total estimate for the entire consortium for implementing a Hybrid P25 Conventional/Trunked system is listed below. This includes not only the costs for each site, but also labor for installation and licensing costs for repeater frequency pairs. Licensing and labor costs for the microwaves are included in the cost for the microwaves.

The following assumptions were used for determining the upgrade needs for each site:

- Grounding upgrade or replacement cost was added if the site survey stated that no grounding existed, grounding was unknown, or grounding was insufficient.
- Building upgrade or replacement cost was added if the site survey stated that the building was in poor or fair condition, the building was made of wood instead of cement, the building lacked available space, or environmentals (air/heat) were insufficient.
- Tower upgrade or replacement cost was added if the site survey stated that the tower was in poor or fair condition, wood towers, microwave was not supported, or the tower could not handle additional antennas. Overlapping coverage by other sites was also taken into consideration.
- Backup power upgrade or replacement cost was added if the site survey stated that no backup power existed or when the backup was battery only.
- For sites that were chosen to be upgraded to trunked sites, the building, grounding, generator, and tower costs were added when
    - The building was not in good condition, did not have sufficient space for growth, or adequate air conditioning or heat
    - The grounding was not up to R56 standards
    - A backup generator did not exist or it was only a battery backup
    - The tower could not handle additional antennas or microwave
- For sites that were chosen to be upgraded to trunked sites the following costs were added to upgrade the site.
    - 1 microwave hop
    - 1 site controller and 1 combiner
    - 3 trunking capable radios
    - 3 trunking upgrades
- Jette Point was chosen to be upgraded to a trunked site. It is assumed that the Northern Tier project will be covering the costs of these upgrades.

Mineral County

Lookout Pass Upgrade to Trunked Site

Grounding	$10,000
Tower Structure	$160,000
Power, Backup Generator	$10,000
Radios (trunking capable)	$60,000
Microwave Hops	$85,000
Site Controller and Combiner	$46,000
Trunking Upgrade	$90,000
Total:	$461,000

Ellis Mountain Upgrade to Trunked Site

Grounding	$10,000
Building	$25,000
Tower Structure	$160,000
Power, Backup Generator	$10,000
Radios (trunking capable)	$60,000
Microwave Hops	$85,000
Site Controller and Combiner	$46,000
Trunking Upgrade	$90,000
Total:	$486,000

Thompson Peak Keep Conventional – Leave site as is

Total:	$0

Sanders County

Clarks Peak Upgrade to Trunked site

Radios (trunking capable)	$60,000
Microwave Hops	$85,000
Site Controller and Combiner	$46,000
Trunking Upgrade	$90,000
Total:	$281,000

Clarks Peak/Hickman Sites Keep Conventional – Leave site as is

Total:	$0

Patricks Knob Upgrade to Trunked site

Grounding	$10,000
Building	$25,000
Tower Structure	$160,000
Radios (trunking capable)	$60,000
Microwave Hops	$85,000
Site Controller and Combiner	$46,000
Trunking Upgrade	$90,000
Total:	$476,000

Green Mountain Upgrade to Trunked site

Grounding	$10,000
Building	$25,000
Tower Structure	$160,000
Power, Backup Generator	$10,000
Radios (trunking capable)	$60,000
Microwave Hops	$85,000
Site Controller and Combiner	$46,000
Trunking Upgrade	$90,000
Total:	$486,000

Oliver Keep Conventional – upgrade infrastructure

Building	$25,000
Tower Structure	$50,000
Power, Backup Generator	$10,000
Total:	$85,000

Ravalli County

Andrews Creek Keep conventional – upgrade infrastructure

Grounding	$10,000
Power, Backup Generator	$10,000
Total:	$20,000

Downing Mountain Upgrade to Trunked site

Grounding	$10,000
Building	$25,000
Tower Structure	$160,000
Power, Backup Generator	$10,000
Radios (trunking capable)	$60,000
Microwave Hops	$85,000
Site Controller and Combiner	$46,000
Trunking Upgrade	$90,000
Total:	$486,000

Reed Butte Upgrade to Trunked site

Building	$25,000
Radios (trunking capable)	$60,000
Microwave Hops	$85,000
Site Controller and Combiner	$46,000
Trunking Upgrade	$90,000
Total:	$306,000

Steep Creek Keep conventional – upgrade infrastructure

Grounding	$10,000
Building	$10,000
Tower Structure	$50,000
Power, Backup Generator	$10,000
Total:	$80,000

Sula Peak Upgrade to Trunked site

Grounding	$10,000
Building	$25,000
Tower Structure	$160,000
Radios (trunking capable)	$60,000
Microwave Hops	$85,000
Site Controller and Combiner	$46,000
Trunking Upgrade	$90,000
Total:	$476,000

Lake County

Ronan Keep conventional – upgrade infrastructure

Grounding	$10,000
Power, Backup Generator	$10,000
Total:	$20,000

St. Ignatius Keep conventional – upgrade infrastructure

Grounding	$10,000
Power, Backup Generator	$10,000
Total:	$20,000

Swan Hill Keep conventional – upgrade infrastructure

Grounding	$10,000
Total:	$10,000

Polson Hill South Keep conventional – upgrade infrastructure

Grounding	$10,000
Total:	$10,000

Polson Hill North Keep conventional – Leave site as is

Total:	$0

Jette Point Upgrade to Trunked - site upgrades to be done by Northern Tier project

Total:	$0

Existing Trunked Sites (add repeaters) $100,000
Add 2 repeaters to Jette Point

Dispatch Center Upgrades $64,000
Assumption: 2 Consolettes per County

Total Project Equipment Costs	**$3,867,000**

Project Management (10% Project Cost) $386,700

Total Project Costs	**$4,253,700**

It cannot be emphasized enough that these estimates should be taken as nothing more than a rough order of magnitude. It is not possible at this point in the project to come up with anything more exact. There are far too many variables, which are not and cannot be known at this time. The reader is strongly encouraged to make careful note of the assumptions made during the costing process. Without that knowledge, the estimate is meaningless.

A number of assumptions and caveats are associated with this preliminary design. The Project Manager worked with representatives from the consortium and Motorola to create this preliminary design. Additionally, the Project Manager drew on the experience of the Northern Tier Interoperability Consortium to refine the costing assumptions used to derive the estimate.

It is critical that this work be centralized through project and frequency management to ensure that what one consortium is building works with another consortium where possible.

Completion of site surveys at the engineering level is beyond the scope of the baseline assessment. Photos of each site are located on the CD that accompanies this report or in Appendix D. The development of site survey criteria is also beyond the scope of the baseline assessment presented here. The criteria will have to be developed during the implementation phase but would include some generally applicable and logical considerations:

- Topography as it relates to transmission efficiency.
- Road access as it relates to equipment needed for site upgrade/improvement
- Electric power requirements for upgraded site.
- R-56 or other grounding standards
- Microwave link capability.
- Screening potential of existing vegetation, structures and topographic features.
- Compatibility with adjacent land uses.
- The least number of sites to cover the desired area.
- The greatest amount of coverage, consistent with physical requirements.
- Opportunities to mitigate possible visual impact.

It cannot be emphasized enough that this is preliminary coverage data. It is critical that in the design phase an in depth engineering analysis be completed to ensure that adequate coverage is provided for local needs. This can best be accomplished through a statewide project management office.

5.6.4 Proposed System Coverage Map

The following figure displays the proposed system coverage map.

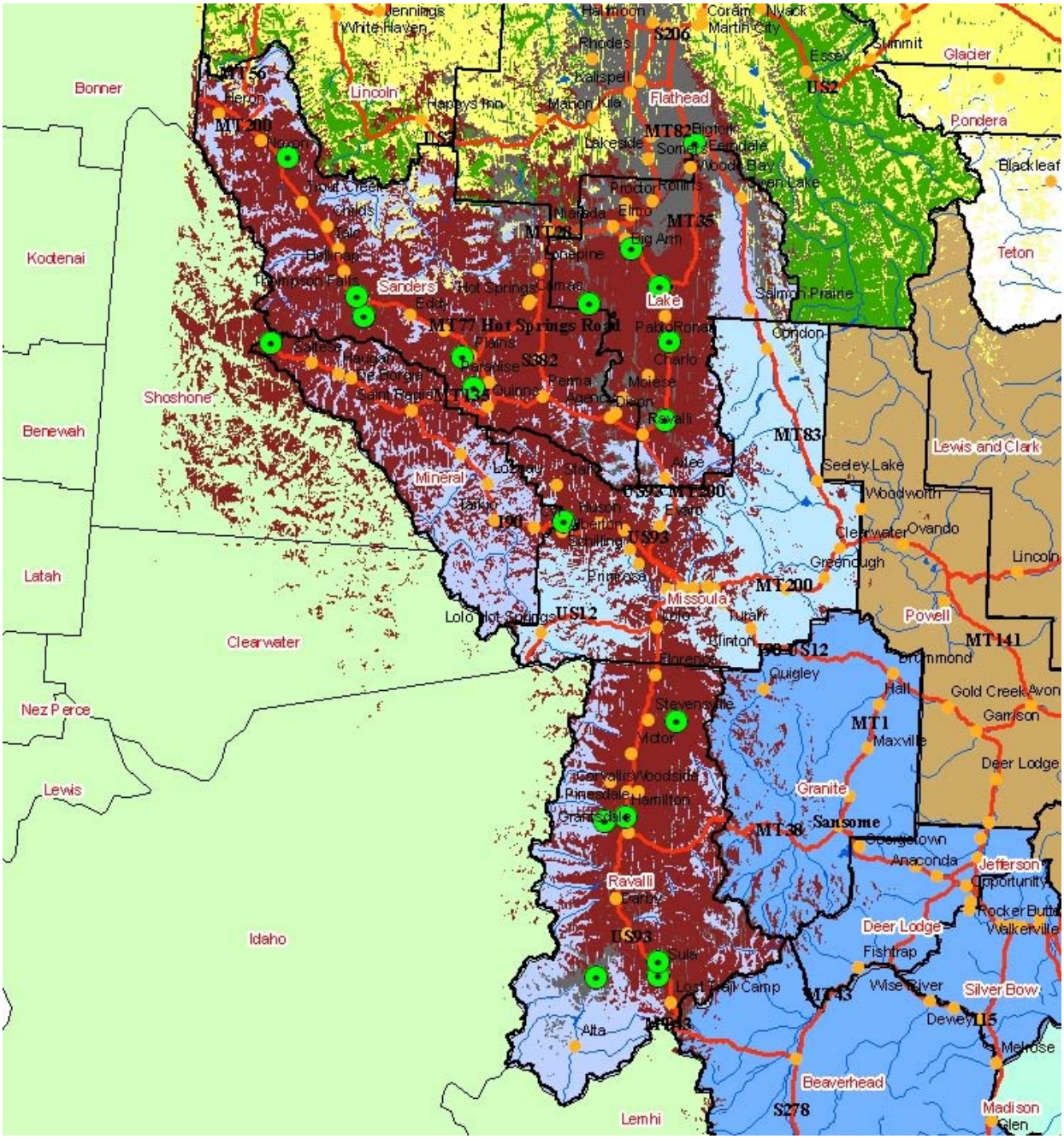

Figure 38 – Planned Sites and Coverage

The coverage map shown here is not to be relied upon for guaranteed coverage. Full engineering coverage maps should be created for each site during the design phase using exact site details. In addition to coverage maps, it is recommended that field-testing be done for several areas to ensure coverage.

5.6.5 Subscriber Unit Cost Considerations

The following table lists three options for the consortium to consider in regard to the upgrade of subscriber units throughout the consortium. Option 1 is takes a minimalist approach and would distribute new P25 trunking capable radios to the command level users as explained in the strategy section. Option 2 would be a middle level option that would allow all radios in the consortium to be narrowbanded and upgrade roughly two thirds of the radios in the consortium. Finally Option 3 would allow every user in the consortium to have P25 trunking capable radios.

See the spreadsheet in Appendix B for details on this cost analysis.

The plan is for a formal review of all agency radios upgrades to be processed in the next phase of the project. Funding and need will be the driving factors and will be used by the Project Directors to allocate funds according to need described in this document as well as discussion in Project Director Board meetings.

Option 1:	Replace minimum “command” level radios	**$179,000**
Option 2:	Replace all “Category 4” and “unknown” radios with new (allows for narrow banding)	**$3,370,000**
Option 3:	Replace all radios with new	**$5,109,000**

5.6.6 Assumptions and Caveats

1. It is assumed that all counties will want to keep their existing equipment and frequencies. As a result, this preliminary design assumes new equipment for the P25, trunked system.

2. The assumption was made to use existing sites, towers, and buildings whenever possible. In order to come up with a worst-case scenario from a costing perspective, those sites deemed incapable assume erecting a new tower and building at each site, unless indicated otherwise in the detail for each site.

3. Costs for renting land or towers are not included in the estimate.

4. The individual estimated costs used to derive the site estimates are as follows:

Estimated Pricing	
$10,000	Generator
$10,000	Grounding
$25,000	Building
$160,000	Tower - 100 ft
$50,000	Tower - 30 ft
$20,000	P25 Trunk CAPABLE Repeater and Antenna
$30,000	Add trunking to site with existing trunk capable repeaters (per repeater)
$6,000	Site controller
$85,000	Microwave - 1 hop
$40,000	Combiner equipment
$11,000	Connect to Trunked System
$8,000	Consollette Base Station
$2,000	Dispatch Trunking Upgrade
$2,000	Frequency Acquisition - Per Pair

Figure 39 –Equipment Pricing List

5.7 Letters of Support

Letters of support for the efforts and goals of the consortium were received from the following stakeholders:

- Sanders County Board of Commissioners
- Sanders County Sheriff's Office
- Ravalli County Commissioners
- Ravalli County Sheriff's Office
- Bitterroot Valley Emergency Medical Services
- Ravalli County All Valley Fire Council

5.8 Risks

These two factors are the only major obstacles to the project.

- Lack of funding
- Lack of stakeholder buy in and commitment

Funding is the key to the project. The Homeland Security Grants are the primary source of funding, but there are many other sources of funding that need to be looked at and tapped into.

Lack of stakeholder buy in is not currently a problem, but it has the potential for high impact if it were to wane. If a good common sense implementation strategy is utilized, then stakeholder buy in will be increased. Keeping the momentum and maintaining the level of interest that has been developed over the past several months is important. This can be done through demonstrated success, small wins, throughout the project.

Keeping the momentum and maintaining the level of interest that has been developed over the past several months is important. This can be done through demonstrated success, small wins, throughout the project.

Some degree of autonomy is relinquished when a shared communications system is implemented and sometimes parochial interests may be an obstacle in establishing a shared system. The system will only be as good as the extent of its acceptance, therefore a strategy to ensure continued communication among all the users is essential through local groups like the radio steering committee while searching for funding.

5.9 Next Steps

Prior to moving on to the design and implementation phase, it is critical that detailed information be gathered in regard to subscriber units, sites, frequencies and exactly what is used at each site. Information that is more detailed will ensure that good decisions are made, and ultimately that funding is used as effectively as possible.

Subscriber Units

There are still quite a few subscriber units listed in the "unknown" category. It is very possible that there are newer radios that do not need replacing in this category. That will ultimately save money.

Site Surveys

Site survey at the engineering level is beyond the scope of the baseline assessment. Photos of each site are located on the CD that accompanies this report. The development of site survey criteria is also beyond the scope of the baseline assessment presented here. The criteria will have to be developed during the implementation phase but would include some generally applicable and logical considerations:

1. Topography as it relates to transmission efficiency.
2. Road access as it relates to equipment needed for site upgrade/improvement
3. Electric power requirements for upgraded site.
4. R-56 or other grounding standards
5. Microwave link capability.
6. Screening potential of existing vegetation, structures and topographic features.
7. Compatibility with adjacent land uses.
8. The least number of sites to cover the desired area.
9. The greatest amount of coverage, consistent with physical requirements.
10. Opportunities to mitigate possible visual impact.

Dispatch Centers

Dispatch centers will also need further investigation in regard to radio consoles and base station connectivity to the overall radio system. Public Safety Answering Points (PSAPs) and 911 centers were not part of this scope of work but will need to be integrated into the overall dispatch upgrade plan.